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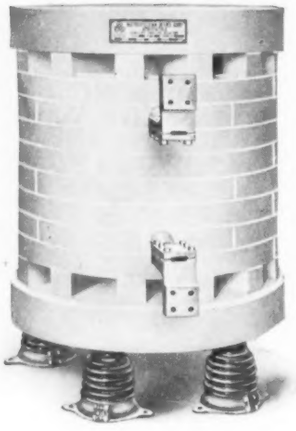

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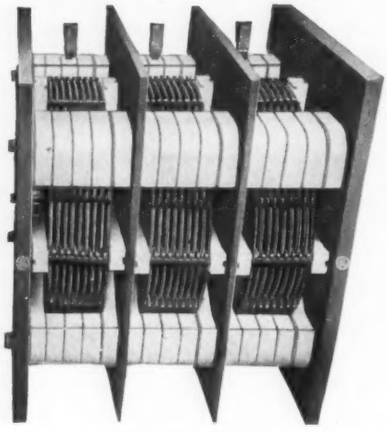

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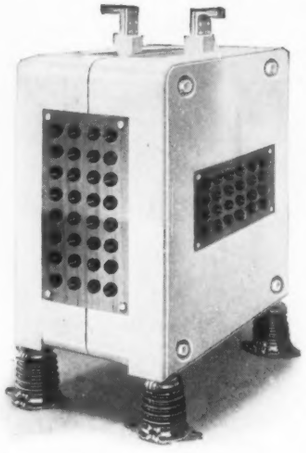

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Electrical World

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Volume 80 — New York, Saturday, December 2, 1922 — *Number* 23

The Quickening Spirit

THESE are great days to be alive and working in this electrical industry of ours. For a quickening spirit is abroad. The subconscious weariness and relaxation that followed the exhaustion of the great war have tapered off. We see it. We feel it. We know that this is so.

The first reaction came when men began to talk courageously and voice an optimistic confidence. Out of this phase of bolstering conversation, this twilight zone of doubting hope, we have come into the warming sunlight of belief, and men have freed their minds to do progressive things.

ALL this does not apply to the engineer so literally. While there has been cause for encouragement, there have been also delays and disappointments. In many cases his plans for progress have had to wait. The engineer has worked out the next step in expansion. Development for him takes shape in full detail on paper first and lies in readiness subject to the influences of changing times. But to the executive, the business man, the market builder it means the difference between day and night. And this has been expressed in many ways.

The N.E.L.A. Commercial Bureaus met in Boston recently and the quickening spirit exhibited itself. These men are eager for new light in their councils. They realize that their ranks are thinned, and now comes pressure from above and from within to build the central station commercially. The urge is strong. The way will be worked out.

The jobbers meet, and the dominant thought is that the electrical dealer must be helped and strengthened by a more substantial co-operation. There is a quickening spirit in the purpose, clearly expressed, to do this thing right now.

And there is a quickening spirit in the present plans and work of the organized groups of electrical manufacturers. It is seen, for instance, in a more fixed determination to develop industry statistics that will guide production and to reduce the number of excess varieties that now burden everybody's overhead.

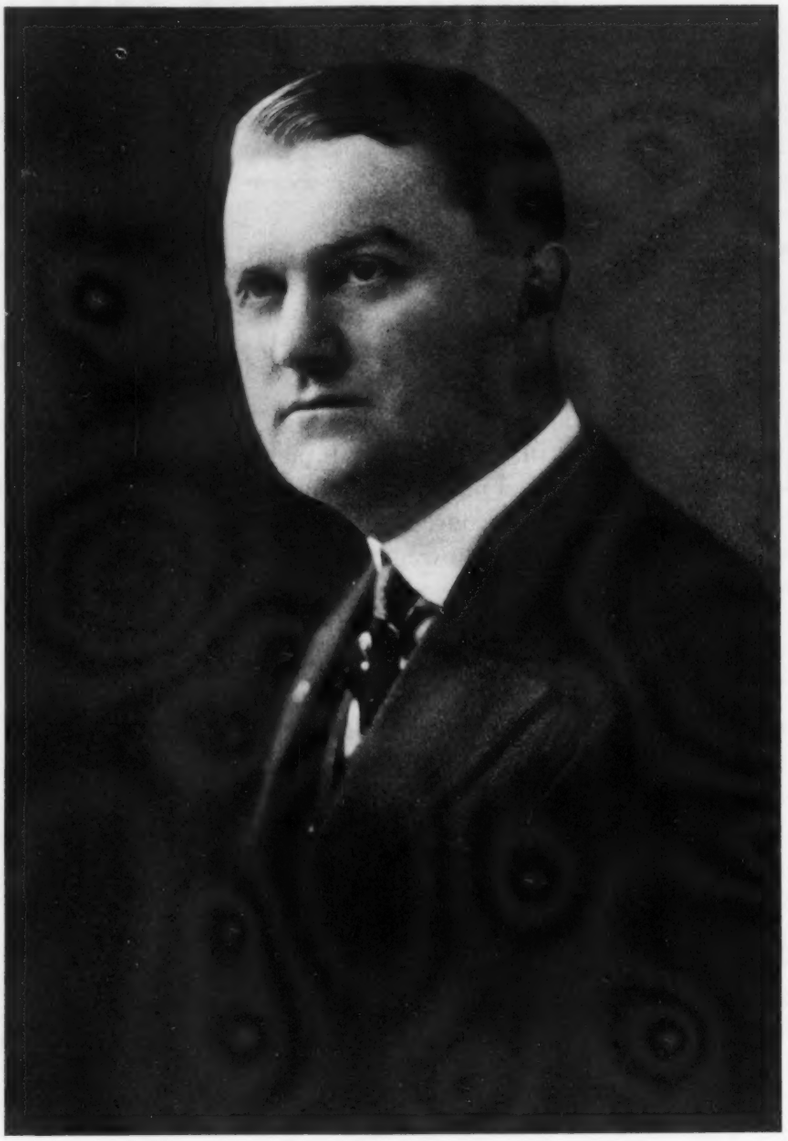
And the continuing discussion of the unknown cost of merchandising in electric stores is another token of the quickening spirit. For it will crystallize in knowledge that will benefit the entire industry.

WE STAND upon the brink of better times and bigger opportunities. We are going forward again. Houses are being built. Factories are working back to full production. Money is cheaper and once more things can be done. The electrical industry will continue to surge ahead.

But we must not forget that it will be no war boom. We cannot hope now once again to float up-tide upon a wave of rising prices. This quickening spirit that we feel must be sustained by vigorous creative work. It must have some foundation in sound knowledge and straight thinking.

A. Emory Wishon

An active exponent of good public relations who is fertile in ideas for developing the electrical industry.



"BACK of practically every human activity," says A. Emory Wishon, general manager of the San Joaquin Light & Power Corporation of Fresno, Cal., "is self-interest. Particularly is it to be found in those activities which apparently make solely for community interest, for in community interest is self-interest best served." Of the gospel of the indissoluble business interrelationship between the electrical industry and community growth—a connection so intimate that the citizen in his own interest must become a strong supporter of his public service utility—Mr. Wishon is the original apostle. By bringing home to the individual the thought of his own welfare as served by community prosperity, progress and development, public utility corporations have established better feeling and clearer understanding with their patrons in every part of the country.

Mr. Wishon did not start life with the ambition to manage a power company. He was born in Missouri and was graduated as a mining engineer from the University of Missouri in 1908. Fate, however, and a family inclination to move, brought him soon after his college days to Coalinga, Cal. Here he promoted the Coalinga Water & Power Company and taught the oil men that it is cheaper to use electric power for pumping oil than it is to use steam power with the oil itself for fuel. Aside from one or two minor installations of direct-current motors in Eastern oil fields, this was the first application of electric power to the pumping of oil, and the fact that appropriate alternating-current motors were worked out by the manufacturers to meet practical oil-field conditions and that the oil men themselves were finally persuaded to try the experiment must be credited alone to Mr. Wishon's foresight and persistence. Since that time electric service has been generally adopted until there are now 37,000 hp. in motors engaged in oil-well pumping on the San Joaquin company's lines and the method is being generally adopted in other parts of the country.

From his Coalinga days Mr. Wishon has progressed steadily further and further away from mining and further and further along the lines of power, until now he is not only general manager of the San Joaquin Light & Power Corporation, but of the Midland Counties Public Service Corporation, the Fresno City Water Company and the Bakersfield & Kern Electric Railway Company. He was one of the originators of the California Electrical Co-operative campaign. In 1919-1920 he served as president of the Pacific Coast Electrical Association.

Editorial Comment

Electrical World, December 2, 1922

Volume 80 Number 23

Safeguarding Public Utility Securities

THE rapidity with which issues of public utility securities are being bought shows the necessity of throwing some safeguards around them in the public interest as well as in that of the industry. Unscrupulous persons can be counted on to take advantage of the situation which feverish buying creates and thereby work havoc with legitimate investments. For instance, the craze for radio was followed by the formation of thousands of spurious radio corporations and the issuance of bales of worthless stock. So monumental and scandalous became the situation that the Department of Justice was soon on the trail of the malefactors. Before a similar deluge of worthless securities overtakes the electric light and power industry every consideration of right and prudence demands that steps be taken to checkmate it.

M. H. Aylesworth, executive manager of the National Electric Light Association, did well in bringing the matter to the attention of the National Association of Railway and Utilities Commissioners and pleading with them to permit only stocks of unquestioned merit and stability to be issued. Similar action has been started by the Investment Bankers' Association, and if the industry will in turn police itself, public confidence will not be abused and much mental anguish will be avoided.

Customer-ownership campaigns are now well under way, and the temptation on the part of weak companies to float securities of doubtful value is very great. Any such tendency must be nipped in the bud, and the commissions and the public utilities which they regulate should be most concerned in bringing about action to this end.

The Rights of a Municipality Served by a Private Company

THE recent reversal by the United States Circuit Court of Appeals of a decision of the district court which had given to the city of Los Angeles the right to condemn a power site in the Owens River gorge belonging to the Southern Sierras Power Company established certain rights of a municipality in regard to water power when that municipality is served through the agency of a privately owned public utility. The lower court, holding that the use of the water by a municipality constitutes a higher use than that by a private corporation, awarded the site to Los Angeles. The Southern Sierras company contended that the power generated by it at the site was used in the service of municipalities other than Los Angeles which had an equal right to the water.

In reversing the decision of the district court the Court of Appeals held that the property of private corporations appropriated to public use in one county may not be appropriated to public use by any other county or city and county while such property is so appropriated and so used. This states clearly the rights of the municipality which is privately served as against that which develops its own power. There has been loose thinking on this subject, and it is a satisfaction to have a court decision at length supporting the reasonable side of the dispute. Every city has the right, if it so desires and expresses itself by a vote of its people, to develop its own water and power supply. By that decision, however, it does not acquire a prior right to all water and power sites as against other sections which have elected to be served by private companies. The advantages claimed by the advocates of municipal and state ownership in all parts of the country are almost entirely those based upon just such special and unjustifiable privileges. It is gradually coming to be realized that exemption from taxation of municipal bonds as well as of the systems themselves is nothing less than a subsidy of the municipality in question at the expense of the rest of the state. The decision under discussion is significant. It gives hope that the time may come when all such factors will be understood and such questions settled upon their real merits.

Unreasonableness of Rates Must Be Established Before Change

IN MANY states the filing of a changed rate schedule with the public utility commission automatically makes it effective within a specified time. Regulatory laws, however, are not uniform in this respect. There are here and there statutes which prohibit the abrogation of a contract for rates with a public utility except after a finding that they are unreasonable. That is, while all contracts are necessarily subject to the legitimate exercise of the police power of the state, it is obligatory on the commission to establish the fact by hearings and show in its finding that the contract rates are unreasonable. Mere averments will not suffice.

This principle has been established by the United States Supreme Court in the case of the Wichita Railroad & Light Company against the Public Utilities Commission of the State of Kansas. Here the Supreme Court insists that an express finding of unreasonableness by the commission was indispensable under the statutes of the state. The appellant purchased energy from the Kansas Gas & Electric Company under a contract terminating in 1930. Under a ruling of the Public Utilities Commission of Kansas, the Kansas Gas & Electric Company was permitted to add a surcharge, based on the cost of fuel, to the rates fixed by contract with the Wichita Railroad & Light Company. The rates thus fixed were substantially higher than the contract rates, and a bill of equity was filed against the commission in the United States District Court for Kansas, the appeal alleging that the order impaired the contract existing between the Kansas Gas & Electric

Company and the Wichita Railroad & Light Company and that the rates fixed were unjust and unjustly discriminatory against the Wichita company, which was the largest customer of the Kansas company, and that the increase in rates violated every equitable rule of rate making and deprived the company of its property without due process of law, besides denying it equal protection of the laws.

The district court issued a temporary injunction, which was set aside by the Circuit Court of Appeals, whereupon the Wichita company appealed to the United States Supreme Court. That court, in reviewing the case and the creation of administrative agencies of the Legislature, holds "that it is a wholesome and necessary principle that such an agency [the Public Utilities Commission] must pursue the procedure and rules enjoined and show a substantial compliance therewith to give validity to its action. When, therefore, such an administrative agency is required, as a condition precedent to an order, to make a finding of facts, the validity of the order must rest upon the needed finding. If it is lacking, the order is ineffective."

Renewed Activity in Steam-Plant Design

THE present activity in the building of power stations has served to stimulate renewed research into the properties of steam and has revived study and discussion of the economies obtainable by the use of higher pressures and superheats. Of course, any discussion of possible efficiencies is affected by the type of expansion cycle used, whether Rankine, Carnot or some other, and the deviation of the actual from the theoretical. Furthermore, with the degree of exactness now required in thermal calculations, the inaccuracies and discrepancies between the existing steam tables—for no two agree—impose limitations upon the usefulness of final results. New research is therefore directed toward acquiring exact data on the properties of steam.

Doubtless there will be found to be several economies resulting from the use of higher steam pressures and temperatures, but the latter item in particular still complicates the practical application of the theoretical principles. Materials so far developed limit the use of extremely high temperatures accompanied by pressure. The alloy steel with special treatment seems to offer opportunity for a successful development as regards boiler tubes and piping, but the superheaters and valves present more difficult problems. The valve, with its unequal expansion and contraction when subjected to temperature changes, is a particularly weak link in the steam chain. In Europe, especially with experimental installations, valve designs have been reported with the metal so distributed as to equalize temperature stresses. As far as that goes, the claim is made that, in general, European steam valves are in this particular better designed than American valves.

Still other elements of the problem are the proper type of joint to use, the question of heat insulation and the extra cost of special materials and of installation. All parts of the problem, however, are subject to an engineering solution, and, judging from the serious attacks now being made upon it by capable engineers, the future should see a degree of development which will cause a marked increase in the use of high-pressure and high-temperature steam in large stations.

How Shall the Rural-Service Problem Be Solved?

ELSEWHERE in this issue will be found a review of some of the high points of the rural-line service situation as it now exists. Conditions have changed radically in the past year. A year ago the farmer was feeling the pinch of deflation. That pinch is still felt, but it is lessening to a remarkable degree, and those who deal with agricultural territories are finding the farmer a shrewd and careful buyer and one who will get the thing he is convinced he wants. That situation is making itself evident in a decided increase in the demand for farm service. There is also evident a decided tendency to question closely the practices on which the service is established. Though this question is coming largely from the individual at the present moment, it will not be long until the organized agencies and the agricultural press will be drawn into the discussion. With this condition rapidly developing it is clearly evident that what has been largely a central-station problem will soon cease to be that and become a joint problem.

What can be done through co-operative effort and how that effort can be organized are questions that cannot yet be answered in detail. That all interested parties should attack the problem as one of common interest and find the solution on sound economic grounds no one can gainsay. In political influence and in nearly all other aspects the American farmer is perhaps the most important factor in our national life. If he demands electric service, he must either have it given to him on a sound economic basis or be shown clearly and without question why he cannot have it. He cannot be told to hunt a warmer climate as some are inclined to tell him when the subject is mentioned. The question must be faced sooner or later. Facing it voluntarily is much easier than facing it by force of public opinion under the threat of legislation which may be instigated as a result of the activities of antagonistic interests.

Reliable Switch Operation by Radio Control

WE HAVE heard a great deal during the last few years about remote control of divers things, from a gocart to a battleship, by radio. Enough experiments have been made to prove that the thing can be successfully done, as might indeed be anticipated. Given a sufficient amount of available energy, it makes no particular difference whether the apparatus to be controlled receives its directing impulses by wire or wireless—the principles of control remain quite the same. Broadly, all such equipments are worked, if more than a very few combinations are necessary, by what is practically a step-by-step mechanism, such as has been in use for many years in the automatic telephone and in the control of dirigible torpedoes. To pass from wire control to wireless is in principle and in fact a simple enough matter, but when it comes to be worked out in a practical way for every-day use the wireless control is much more delicate than the earlier method. This is chiefly because there are opportunities for interference in wireless control which are not present where a conductor is available. The big difference therefore, and the big step in advance which has to be made to reach success in wireless control, is in such elimination of interference as will enable the wireless impulses to

operate the necessary relays without interruptions of service or false alarms.

The paper by F. W. Dunmore of the Bureau of Standards which we publish this week gives a very interesting view of the way in which a radio-control relay can be made to meet the necessary demands of a controlled system. The ingenuity of the experts of the bureau has apparently evolved a delicate and reliable relay capable of receiving and passing on the impulses from a distant station in an extremely efficient way. Given the relay and the means of tuning so as to receive signals selectively from a desired station, the apparatus can be put to a wide variety of uses, as Mr. Dunmore shows. By the cleverly conceived plan of working at different audio frequencies while operating at substantially the same wave length, the tuning out of undesirable stations seems to be accomplished so successfully that interference even when the received impulses are of nearly the same strength is renderd unlikely.

The connections and description of the apparatus tell their own story of successful ingenuity. The main point is that, thanks to the activity of the radio laboratory of the Bureau of Standards, an admirable relay has been developed capable of being put to a wide variety of uses in the way of remote control. With this relay, which is the secret of the whole matter, the rest of the accomplishment is relatively easy. The vital question from the standpoint of the engineer is whether this new relay is rugged enough and reliable enough to be thoroughly dependable twenty-four hours a day and fifty-two weeks in the year if it has reasonable care. Questions of this sort can be answered only by an appeal to experience which is not yet available. Remote control of an automatic substation or switching stations for various purposes is, of course, a thing very greatly to be desired, and we hope that at an early date some progressive company will try out the plan on a scale sufficient to give definite information as to its applicability. Hitherto radio as a means of communication, however convenient, has not given satisfactory proof of continuous reliability; hence the importance which we attach to this announcement of what appears to be a greatly improved receiving apparatus.

Specialized Applications in Underground Electric Systems

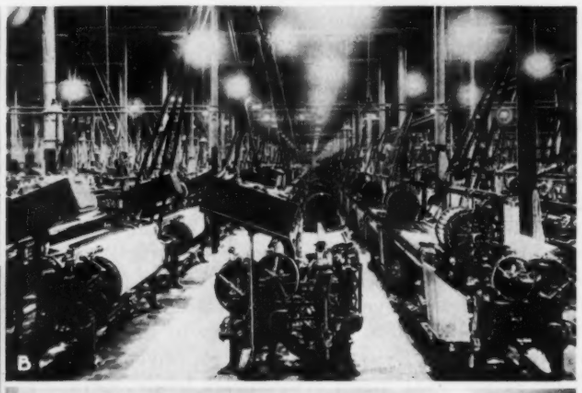
THE system for the supply of electricity in mines and similar underground workings has been developed as a specialized application and offers several contrasts to overhead installations. It has been a growth along lines dictated by the abnormal environment. It is startling as well as interesting to find substations far underground and supplied by high-tension cables installed in bore holes. Moreover, the methods of installing cables in confined spaces subject to gases, acids and moisture are distinctly specialized. Safety is a primary consideration in many of these underground installations, for a spark in a coal mine, for example, may result in an explosion. Secondary considerations are portability, flexibility and equipment that uses a minimum amount of space. Even the weight of the cable must be considered, as is brought out in the article on "Installing Pit Shaft Cables" published in this issue.

A very rapid development is occurring in installations of this type, marked by the use of automatic equipment, of new types of cables and of new methods for installation. The close co-operation of engineers in this line of endeavor with those connected with overhead systems has resulted in mutual advantages.

The Electrically Heated Boiler in Practical Use

THE proposal to utilize electrical energy for the direct heating of boilers for the production of steam is a very old one in the electrical art. It would be a matter of interest to know how many times this particular device has turned up in the Patent Office in the last forty years. Looking at the matter from the viewpoint of larger utility, using electrical energy to produce steam for industrial heating by a relatively very inefficient prime mover would seem to be about as unpromising from the standpoint of economy as any procedure which could be imagined. Yet as a matter of fact there are instances in which the electrically heated boiler may be decidedly the less of several evils, and it has actually pushed its way into use abroad. Where there exists at times in a hydro-electric plant a surplus of water which cannot itself be economically stored and which cannot conveniently be put to other than electrical purposes, there may well be a limited field for the boiler-heating scheme. In most American practice, if surplus capacity unusable in ordinary electric ways exists, it cannot be utilized indirectly by the production of steam, for lack of suitable market. In order for the boiler-heating idea to become worth considering economically one must assume conditions where hydraulic storage directly or by accumulators is not feasible, and where a storage battery is for one reason or another inadvisable for use to do the same work.

Natural or artificial water storage is the usual answer to irregularities of flow. There are conditions, however, when it becomes unreasonably expensive. The hydraulic accumulators or compressed-air distribution may furnish within narrow limits means of utilizing extra power during periods when the electric plant itself cannot meet the necessary requirements. Both these plans are somewhat inefficient and expensive. The storage battery is expensive, although efficient even where direct current is utilized. It ceases to be an efficient reliance, however, when the current must be converted from alternating to direct before the charging process and reconverted thereafter. There may exist conditions where heating a steam boiler electrically will prove a useful procedure. For example, if a hydro-electric plant have considerable surplus power at odd times, it can be stored as superheated water over part of the working day and used to assume the night load while the reservoir is filling up for the normal day's run. Or a similar process can be used where some industry has to be operated at a time otherwise very disadvantageous for the supply plant, as, for example, when it is necessary to store power for an unpleasantly great lap load. As the article which we publish this week on the subject indicates, a properly designed and insulated electrically heated boiler stores the heat with such great efficiency as to make up in simplicity of apparatus and low cost for the necessarily somewhat low efficiency of the prime mover operated. In other words, the method within certain rather close limitations has given sufficient promise of usefulness to be brought into service on a considerable scale as an auxiliary and offers some advantages in certain localities.



Modern Lighting Applications Result in Increased Intensity, Minimized Glare and Flexible Operation

A—Uniform distribution of illumination features display space in R. H. Stearns & Company store, Boston.

B—Clear-cut illumination and absence of sharp shadows are secured by new installation in weave room of American Printing Company, Fall River, Mass.

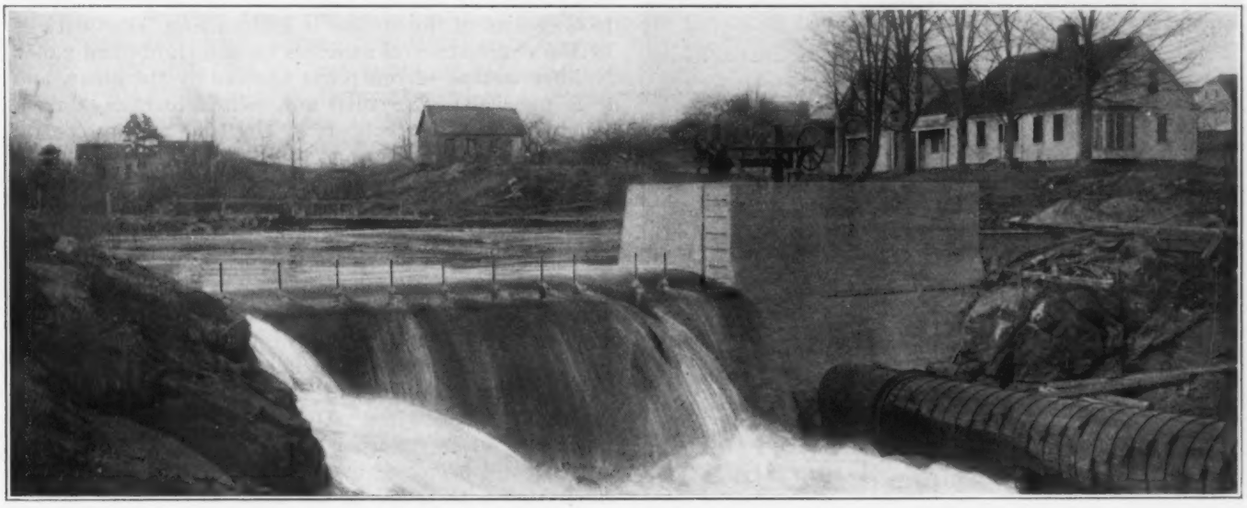
C—Well-spaced overhead units provide good lighting for this shoe store.

D — Artificial sunlight supplemented by bracket lighting gives pleasing results in new Ambassador Restaurant, Boston.

Remote Control for Small Plants

How Parallel Operation of Two Small Hydraulic Plants Was Made Possible Without Excessive Cost to Take Care of a Load Suddenly Increased by War Requirements

By E. S. LINCOLN
Consulting Engineer, Portland, Me.



HYDRO-ELECTRIC AUXILIARY STATION BUILT OF REINFORCED CONCRETE FOR REMOTE-CONTROL OPERATION

DURING the late war a small power plant in Maine which was running at full load was confronted with the problem of supplying considerable additional power for use in shipyards and other new industries. The company served a small population and had a large transmission system and a limited supply of water. It had available one generating station of 400 kw. capacity and was supplying two communities, one within 3 miles of the plant and the other 17.5 miles away. In the same building with the power plant was a mill which took 50 per cent of the output of the entire plant with a load factor of nearly 100 per cent.

Additional power by steam generation was out of the question owing to the prohibitive cost of operation. The problem was solved by developing on a nearby stream a small hydro-electric plant which was controlled from the main generating station.

Fig. No. 1 shows diagrammatically the location of the power plants in relation to the various towns served. The greatest amount of energy outside of the mill at the main plant was consumed through the substation shown in the diagram and marked "Boothbay Harbor." The lines feeding this substation were protected by directional power relays, which would disconnect either transmission line in case of difficulty, thus allowing the second line to carry the entire load. The arrangement was very flexible, making it possible to supply energy from either station to any part of the system, even in case of a break in one of the transmission lines.

The main generating station contained two 200-kw. belted generators driven by two Holyoke turbines operating under a 50-ft. head. The water power consisted of a lake containing approximately a billion cubic feet of water and fed by a drainage area of 57 square miles. The development was practically based on storage, depending upon the spring rains and melting snows for its water. From this station a 2,200-volt circuit was connected to a small substation and the voltage stepped up to 11,000 for transmission.

Additional power was supplied by building a small hydro-electric station 9 miles from the main station and on a different watershed. This station was made of reinforced concrete, as was also the surge tank shown with it in the illustration above.

The water power was supplied from a chain of lakes storing about eight hundred million cubic feet of water and having a drainage area of approximately 36 square miles. This also was a storage development and worked out very satisfactorily by proper use of the water between the two stations. By building a dam 50 ft. in length on the ledge a 27-ft. head was obtained.

The waterwheel contains two runners and these are controlled by separate gates. A small belted generator of 100 kva. rating is for use during low water. As the head drops the turbine cannot maintain its rated speed with any economy. During this period one of the gates is closed and one runner of the waterwheel is allowed to operate at a lower and more economical speed. The turbine is then belted to the small generator and the larger generator allowed to operate for its flywheel effect.

OPERATING CONDITIONS ARE VARIABLE

This station can be operated either by an attendant or from the main generating station at Damariscotta by means of a "home-made" remote-control system.

The operating conditions were such that "automatic" control was out of the question since it would prove too costly for such a small system. There are times when

it is necessary to operate both plants at full load and other times when the plants are operated separately. This depends entirely upon the load conditions and the amount of water available in each of the storage basins. The lower-head plant (27 ft.) was always run when it was possible to save water in the main plant, which with its higher head would produce more power than the other.

Any arrangement for operating the plant according to the level of the lake was impracticable, as in such a large storage basin the changes were very gradual. Under the circumstances it was decided to install the

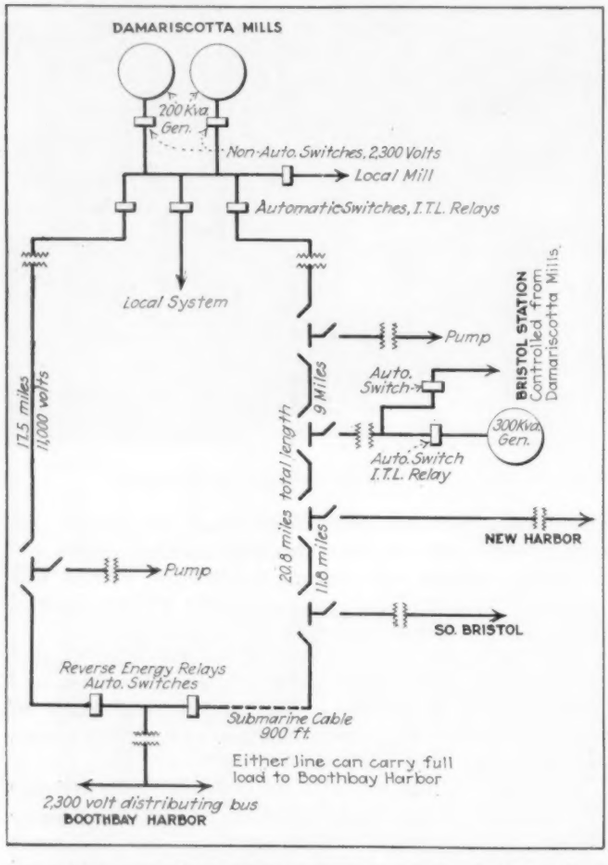


FIG. 1—AN INTERCONNECTED NETWORK WHICH NECESSITATED PARALLEL OR SEPARATE OPERATION OF THE PLANTS COMPLICATED THE CONTROL SYSTEM

simplest possible control system—one that could be taken care of by the average operator. In small towns it is difficult to obtain the services of a competent operator, and with the modern plant there is very little for him to do. Under the circumstances a remote-control system was installed which would allow the operator to devote considerable time to line work, reading meters and getting new customers and to visit the plant about once a week or whenever necessity required his presence.

CONTROL SYSTEM USES POLARIZED RELAYS

The system decided upon is shown in Fig. 5. The principle of its operation lies in the use of polarized relays. Each relay requires only one wire, and the return circuit for any number of relays can be taken care of by a single or common wire. By means of a double-throw, single-pole switch each relay can perform two functions, such as turning a switch on or off.

The polarized relays used in this system are installed in the Bristol station and shown at *A*, *B* and *C*. The single-pole, double-throw, momentary-contact switches which control these relays are shown at *D*, *E* and *F* in the main power house. The relays are shown in Fig. No. 4 in the middle of the left-hand panel. Above these relays are shown switches and instruments which are used for charging the storage batteries used in connection with the system. These relays, when the control system is in use, operate the remote-control switch and rheostat, which are shown back of the panel. When local control of the station is desired it is taken care of by the remote-control switches on the right-hand panel. Neither method of control is affected by the other, and it is unnecessary to turn any switch to change from remote to hand control. If at any time remote control is not desired, the disconnecting switches in the station can be used.

The control system at the Bristol station stops and starts the waterwheel, regulates the generator voltage, turns the main swich on and off, synchronizes and gives the load on the station. This is done by the use of six galvanized-iron telephone wires which run parallel with the 11,000-volt high-tension system and on the same poles. Considerable difficulty from induction was experienced, but this was eliminated by transposing both transmission and control wires. Overloads on the station are taken care of in the usual way by overload relays, and bearings are protected by means of thermostats used in connection with relays in the usual way.

WATTMETERS INDICATE LOAD CONDITIONS

At the main station a wattmeter having a zero center is connected in the line between the two stations. By means of this wattmeter the direction of power and the amount of power can be obtained. All possible conditions of load occur on the system within the limits of the station, sometimes in one direction in one transmission line and in the opposite in the other line, according to circumstances. By means of the wattmeter just mentioned and those on the other lines and the generators the exact load conditions of the system can be obtained. There are several operating problems that might arise with such a system, but they have not manifested themselves in this particular case. A question presented itself as to the method of notifying the operator in the main station in case the main switch in the Bristol station should be thrown out. Such an occurrence would undoubtedly be caused by a short circuit on the line, which in such a small system usually trips the switch in both stations. The operator would find this

LIST OF MATERIAL FOR CONTROL SYSTEM

(Total Cost $750)

Main Stations	Controlled Station
Battery 56 cells type CT, storage battery 1 voltmeter, 0-60 1 ammeter, 0-3 2 DPST switches, 30 amp.	Battery: 56 cells type CT, storage-battery 1 voltmeter, 0-150 1 ammeter, 0-3 2 DPDT switches, 30 amp.
Line: 5 lightning arresters 6 SPST 15-amp. disconnecting switches. 6 Edison fuses	Line: 5 lightning arresters 6 SPST disconnecting switches
Control System: 3 momentary-contact switches 1 DPDT switch, 30 amp. 1 reactance, 78.2 ohms. 1 250-ohm telegraph relay 1 load meter (millivoltmeter and shunt)	Control System: 3 polarized relays 1 reactor, 78.9 ohms 1 potential transformer, 2,200-354 volts

out from the load-indicating device on the waterwheel, which would show that it had lost its load. The local load near the station itself is very light.

The switch *D* in the main station operates relay *A* in the Bristol station, which would either stop or start the waterwheel and regulate its speed. Switch *E* controls relay *B*, which in turn operates the field rheostat of the generator. Switch *F* operates relay *C*, which turns on and off the main switch in the station under control. The voltage of the Bristol station is shown in the main station on the regular station voltmeter, and the plant is also synchronized from the main station. Synchronizing is done through switch *G*. This switch is thrown to the right until the voltage readings and synchronizing indications are correct for the Bristol stations. Just as soon as synchronism is reached switch *G* is thrown immediately to the left. This operates the main switch in the Bristol station. It is, of course, necessary to have switch *E* in the "on" position when switch *G* is thrown to the right. After the machines are synchronized switch *G* is maintained in its right-hand position, giving the voltage indications of the Bristol station at all times. When it is desired to disconnect the Bristol generator, switch *G* is put in the left-hand position and switch E pushed to the "off" position.

As the diagram of the station is quite complete, it is not necessary to go into detail. Connections for charging the storage batteries in the main station are shown, as is also the outline of the rheostat and switch connections in the station under control.

All equipment used is of standard make, and the only special appliance required was the "home-made" switch shown in lower corner of Fig. 5. The equipment in the Bristol station consists of a remote-control rheostat and generator switch or the ordinary solenoid-operated type with a motor-controlled governor. The control system referred to was connected to this regular remote-control system by means of the polarized relays.

In order to give the proper voltage indication in the main station from the controlled station a special potential transformer was necessary having a secondary wound for 354 volts. The cost of this, however, was practically the same as that of a standard transformer. In order that the current from the potential transformer shall not interfere with the operation of the relays, a special reactor is used in connection with relay *B* and switch *G*. This reactor does not affect their operating on direct current from the battery, but does protect them from the alternating current.

The load on the Bristol station is shown on meter *H* in the main station. It is measured by means of a movable contact on the gate-indicating device on the governor. As this indicator moves it increases and decreases the resistance in series with meter *H*. The meter is calibrated to show the gate opening on the waterwheel. The operator has a daily record of the head of water available, and from this he can tell the load on the plant.

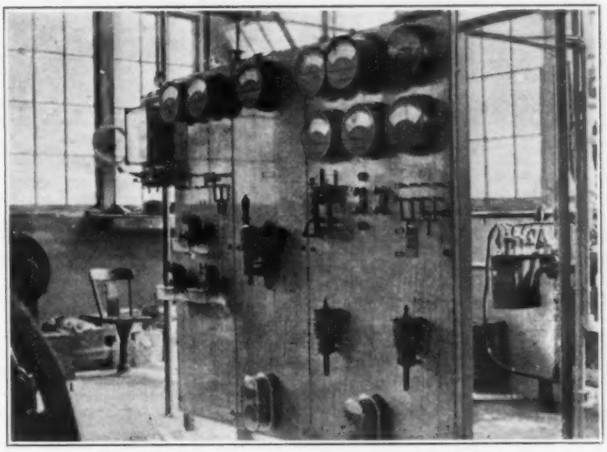


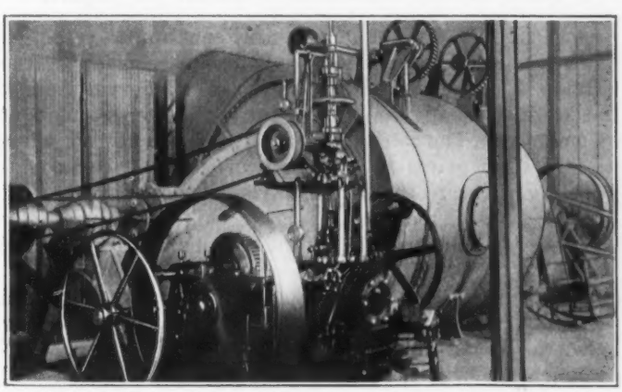
FIG. 4—CONTROL RELAYS WERE MOUNTED ON THE SWITCHBOARD PANELS

COST WAS VERY LOW

Outside of the control lines between the stations the cost of the entire system was $750, and the amount of materials and labor necessary was very small. In addition to the storage batteries and other charging equipment all that was necessary in the main generating station were three momentary-contact switches, a "home-made" reactor and a Weston millivoltmeter. A small shunt was made for this meter to give the proper indications when connected in series with the governor-indicating device. Vacuum-tube arresters were used on all control lines at both stations.

In the Bristol station it was necessary to provide three polarized relays, a special potential transformer, a small reactor and the "home-made" gate-opening indicator. In some cases it might be more convenient to operate the gate-indicating device on the waterwheel gates. This, however, depends entirely upon circumstances, and in any event the arrangement is comparatively simple.

In order to protect the meter *H* in the main station,



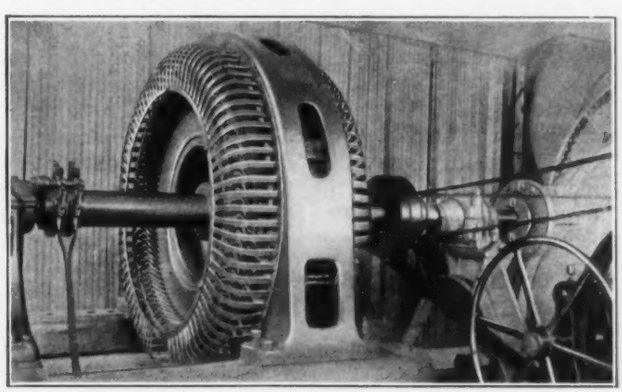


FIG. 2—THE GOVERNOR IS USED TO SUPPORT A "HOME-MADE" SWITCH. FIG. 3—AT LOW WATER THE LARGE GENERATOR OPERATES AS A FLYWHEEL AND A SMALL UNIT IS BELTED TO THE TURBINE SHAFT

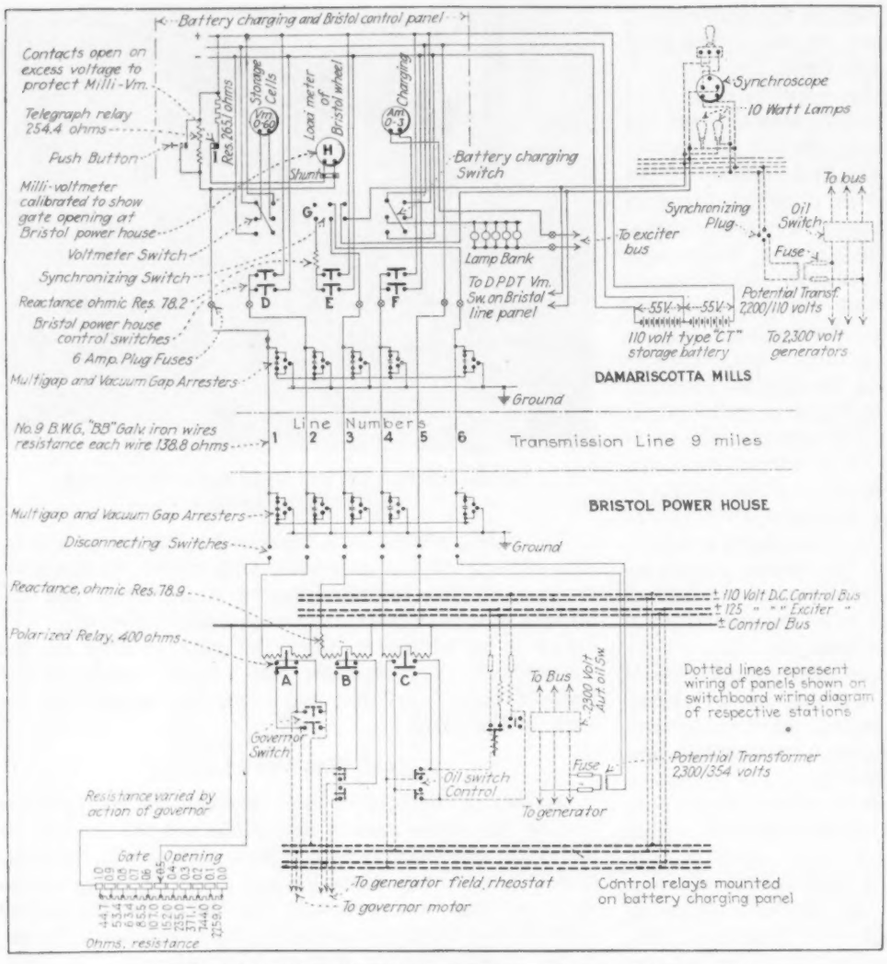


FIG. 5—POLARIZED RELAYS WERE USED IN THE CONTROL SYSTEM TO ASSURE SWITCH OPERATION

which shows the load on the Bristol station, it was connected in series with an ordinary telegraph relay shown at *I*. In case of excessive voltage of line No. 1 controlling this meter the contacts would open on the relay before the meter could be damaged. In order to reset this relay a small push-button was used to short-circuit the magnet windings.

The list of the material used is shown in the table herewith. The table does not include the material and labor used on the transmission line. The transmission line for the control system was built at the same time as the power line, and the cost of construction was approximately $3,500. This makes a total cost of $4,250. With the additional cost of the solenoid-operated rheostat and main switch in the controlled system, the total cost did not exceed $4,500. From this figure it will be seen that a considerable saving in labor can be made by using such a system. Interest, depreciation and maintenance amounting to 10 per cent would bring a yearly cost of $450. The cheapest operator that could be employed in this locality would have cost $1,000 a year.

System Operates Satisfactorily

The system has been in operation several years and the only difficulty experienced has been caused by trees interfering with the control wires, which leave the transmission line for a short distance and run through a wooded section. Insulated wire has been used to overcome this difficulty.

The success of the system described shows that it is possible for progressive central-station operators to rig up their own control system, and by studying the situation carefully, it will be found that they could put up a very inexpensive system which, properly installed, would give them reliable service. There are a great many possibilities of applying remote control which will eliminate the use of additional labor and in many cases will give better results than can be obtained from incompetent operators.

In the company's office at Boothbay Harbor a small panel containing a recording voltmeter and frequency meter is mounted from which an indication of the operation of the system can be obtained. This panel also contains five indicating lamps for use in connection with the substation. When all the switches in the substation are "on," green lights are shown, but as soon as one of the switches trips it rings a bell in the office, showing its location by means of a red light. An indicator is also used to show when the storage batteries in the station have become nearly discharged. This gives notice immediately whenever any difficulty is experienced and makes it unnecessary to keep an attendant in the station. Thus a few simple devices add to the accuracy and convenience of the station operation and satisfy the executive that his system functions properly at all times or locates the trouble under abnormal conditions.

New Land Wireless System in Japan

APPLICATION for government sanction to establish a wireless telephone system has been made by the Daido Electric Power Company of Nagorya, Japan, according to advices received by the Department of Commerce. The company proposes to operate this wireless system primarily for its own convenience in connecting the various stations with an electric light and power system, but its use may be extended eventually to the general public if sufficient demand for it should arise.

According to the present plan the wireless system will extend from Okuwa to the Lagano Prefecture on the Central Japan Railway Line, from which point communication will be established through Nagorya and through and as far as Osaka, a distance of about 150 miles.

Economy of High-Pressure Steam*

Pressures Up to 1,500 Lb. Are Commercially Obtainable—Present Materials Limit the Maximum Temperature to 750 Deg.—Greatest Immediate Economy Possible Is Found to Be Through Reduction of Existing Heat Losses

By GEO. A. ORROK
Consulting Engineer, New York, N. Y.

IT IS well known that steel when heated to comparatively low temperatures, say 900 deg. or 1,000 deg., loses its strength and becomes unfit to sustain loads, and that heat strains from even a moderate heating of 300 deg. or 400 deg. may cause certain deformations of a highly undesirable character. Cast-steel valves have deformed at 750 deg. to such an extent as to render them useless, and the "growth" of ordinary cast iron at temperatures above 450 deg. is known to be destructive. Notwithstanding these facts, plants have been constructed for 250 lb. to 300 lb. pressure and 700 deg. maximum temperature, and some are under construction now designed for 400 lb. and 530 lb. respectively. The first cost is not excessive, repairs are moderate, and the life of the installation is all that can be desired.

What, then, are the commercial limits of pressure and superheat in the central station? It will be seen from Fig. 1 that the regenerative cycle for saturation follows very closely the efficiency of the Carnot cycle, while the Rankine cycle falls below the latter increasingly with rise of pressures. The superheat lines for both cycles are nearly parallel and maintain this characteristic over a wide range. The gain from regeneration increases with pressure and is constant for equal superheat. For any final temperature the gain from pressure increments decreases, but the gain from regeneration increases with pressure increments. Thus, at 750 deg. final temperature the Rankine efficiency increases from 33.5 per cent to 40.5 per cent with pressure rise from 200 lb. to 1,200 lb., while the regenerative efficiency increases from 37 per cent to 48.5 per cent with the same pressure increase.

TABLE I—SAVINGS EFFECTED THROUGH INCREASE IN STEAM PRESSURE

Case	Cycle	Pressure, Lb.	Maximum Temp., Deg. F.	Theoretical Efficiency per Cent	Station Efficiency, per Cent	Actual Efficiency, per Cent	B.t.u. per Kw.-Hr.
1	Rankine	200	750	33.5	55	18.4	18,500
2	Rankine	1,200	750	40.5	55	22.3	15,300
	Gain			21			3,200
3	Regenerative	200	750	37	55	20.35	16,800
4	Regenerative	1,200	750	48.5	55	26.7	12,800
	Gain			33.3			4,000

As shown by Fig. 2, not much benefit can be expected from increasing pressure with the ordinary methods of using steam. Increase of temperature helps to some extent, but not enough to be attractive, since the saving is nearly always offset by the additional fixed charges.

With the regenerative cycle the results are much better and useful savings are indicated, increasing considerably with pressure and slightly with temperature. It is evident that some such regenerative cycle must be used if increased economies are expected from higher pressures and temperatures, but the rewards from increasing temperature are not commensurate with the costs. Many regenerative cycles are possible, but the one used shows nearly the maximum economy. Such cycles need many heat interchangers and a number of separate feed pumps for the close approach to theoretical figures. So far four or five stages have been the ultimate practical application, and not more than three have stood the commercial test. It therefore appears that considerably better design must be incorporated in apparatus if many steps are proposed, and also that more consideration should be given to operating difficulties.

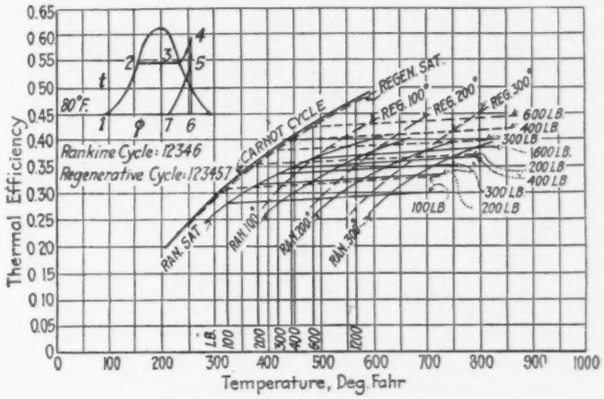


FIG. 1 — THEORETICAL THERMAL EFFICIENCY OF THE CARNOT, RANKINE AND REGENERATIVE CYCLES

Using both saturated and superheated steam for pressures up to 1,200 lb. and superheats of 750 deg. and above.

Grouping the station losses, which are not shown in Fig. 1 and which aggregate around 55 per cent, it may be said that the generator efficiency is 97 per cent, turbine efficiency 78 per cent, boiler efficiency 80 per cent, leaving 91 per cent for the efficiency of auxiliaries, piping and radiation. Using the foregoing figures, the saving by regeneration when using 200 lb. pressure (case 1, case 3, table I) is 1,700 B.t.u., and when using 1,200 lb. pressure (case 2, case 4) is 2,500 B.t.u. Considering the trend of the curves in Fig. 1, comparatively little is gained by further superheating. The flattening out of the curve is still more marked as the temperature increases above 800 deg.

Since the critical temperature of water is 704 deg. and the critical pressure is 3,200 lb., and since oil-still temperatures up to 1,100 deg. have been used, the foregoing temperatures and pressures may be considered usable so far as critical temperatures are concerned. Allotropic changes occur in steel at about 1,300 deg., and 1,100 deg. is well below this point. At this tem-

*Based on a paper to be presented before the American Society of Mechanical Engineers in New York, Dec. 4 to 7.

perature, however, the physical properties of steel used in power-plant construction need serious consideration.

Good boiler steels increase in tensile strength up to about 600 deg. to 700 deg. and lose much in ductility, but above 800 deg. the tensile strength rapidly falls off and ductility largely increases. Cast steel of proper carbon content and suitable for fittings, valves and turbine construction shows the same properties within rather narrow limits. Pipe steels have nearly the same characteristics, but the temperature at which the tensile strength starts to fall is around 550 deg. to 600 deg. This lack of ductility or increase of brittleness at the maximum temperature of use must be compensated for by a larger factor of safety—i.e., increased thickness and weight with higher cost—and a more careful selection of material. With increased thickness, however, it must not be forgotten that the safe stresses must be correspondingly lowered.

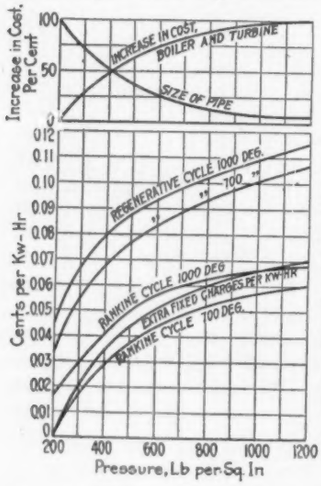


FIG. 2
COST OF INSTALLING AND ECONOMY IN USING PRESSURES ABOVE 200 LB.

The savings afforded in cents per kilowatt-hour, based on the Rankine cycle at 200 lb. and 700 deg. maximum temperature and coal at $6 per ton. The extra fixed charges per kilowatt-hour are plotted separately. At the top of the figure are two curves showing the increase in cost of boiler and turbine and the decrease in size of pipe required for a given quantity of steam. The extra fixed charges are always greater than the coal saving for the Rankine cycle (ordinary operation) at 700 deg. maximum temperature, and the additional gain for 1,000 deg. maximum temperature barely exceeds the additional fixed charges.

The variation of strength of materials with temperature may be considered from five points of view, depending on the conditions under which the materials are to be used:

Boiler Material—The maximum temperature cannot exceed 704 deg., the critical temperature of water, and the fire side of the tube or drum can only be a few degrees hotter. If 1,200 lb. to 1,800 lb. per square inch be the chosen pressure, the water temperature is 625 deg. at the maximum and the fire side will not exceed 725 deg. normally. This temperature is well within the maximum strength zone, and only care is needed to secure sufficient ductility.

Superheater Material—The maximum temperature of the inner surface of the tubes may be a little higher than the maximum superheat. The outer temperature depends on the position in the boiler. Radiant-heat superheaters are now commercial where the pressure parts are protected with a heat-absorbing and conducting covering of cast iron. The fire surfaces may be 1,400 deg. to 1,600 deg., while the inner-wall temperature is as low as 700 deg., but 1,100 deg. is comparably easy of attainment. Bare-tube superheaters would have a maximum outside temperature of around 1,200 deg., but their life at this temperature is unknown. The maximum safe point may be taken as 800 deg. superheat temperature and 950 deg. outside temperature.

Neither the tube manufacturers nor the superheater manufacturers are afraid of these conditions, and they are prepared to guarantee their product under them.

Piping Material—Under this category the condition is markedly different. The steam side of the pipe is below the maximum temperature of the steam. The outer surface is much lower and the thickness of the material can be increased to compensate for the lower elastic limit of the material. The ductility improves with temperature increase. Pipe joints are the only serious trouble, and the modified Van Stone joint with pipe edges welded for tightness is the apparent solution. Experience with this joint has been satisfactory.

Valves and Fittings—Valves and fittings must necessarily be made of castings. The low carbon, open-hearth steel used, while falling off in strength sooner than the worked material used in boiler and piping construction, has still a respectable elastic limit at 1,100 deg. As in the last category, the inside wall temperature is lower than the steam temperature and the outer wall has a still lower temperature. The shape of the casting is all important. Globe valves of the double-beat or Wanick type can be made with practically no flat surfaces and with two axes of symmetry. Internal pressures do not seriously deform this design, but external strains may cause minor troubles. Throttle valves and marine stop valves are usually of this type and can be kept tight at 750 deg. It is probable that a temperature of 1,100 deg. can be safely undertaken with these valves if special precautions be used in the design of the seat, disk and stem. Flexible-disk, double-beat valves are used in Europe at temperatures in excess of 750 deg.

Gate valves have only one axis of symmetry and have flat surfaces of considerable size. With these seat and disk troubles are encountered at temperatures above 700 deg., and it may be some time before manufacturers can guarantee a tight job at the higher temperatures. This type of valve is peculiarly sensitive to outside strains, which tend to deform the seats and disk.

Turbine High-Pressure Ends—Pressures can make little difference here as the high-pressure parts are comparatively small, and without doubt the pressure will be reduced 50 per cent in the first nozzle. There need be no high-pressure stuffing box, so that the highest pressure to be packed against will be about half the maximum. Temperature strains will be the only thing that need be considered; the expansion will reduce the superheat in the first-stage nozzle to a workable

TABLE II—SAVINGS IN COAL WHICH MAY BE EFFECTED WITH PRESSURES OF 200 LB. TO 1,200 LB. AND SUPERHEATS OF 700 DEG. TO 1,000 DEG., USING REGENERATIVE AND RANKINE CYCLES

Pressure, Lb. per Sq.In.	Superheat Temp., Deg. F.	Carnot Efficiency	Regenerative Efficiency	Rankine Efficiency	Regenerative × 0.55	Rankine × 50.5	Regenerative B.t.u.	Rankine B.t.u.	Saving Over Rankine 200 Lb. 700 Deg. B.t.u. per Kw.-Hr. Regenerative C.	Saving Over Rankine 200 Lb. 700 Deg. B.t.u. per Kw.-Hr. Rankine C.	Saving in Lb. Coal per Kw.Hr. (13,800 B.t.u.) Regenerative C.	Saving in Lb. Coal per Kw.Hr. (13,800 B.t.u.) Rankine C.
200	700	53.5	37	33.4	20.3	18.35	16,820	18,620	1,800	....	0.13	.....
400	700	53.5	41.2	36.3	22.6	19.95	15,100	17,120	3,520	1,500	0.255	0.109
600	700	53.5	43.5	38	23.9	20.9	14,300	16,350	4,320	2,270	0.313	0.1645
1,200	700	53.5	47.5	40	26.1	22	13,100	15,500	5,520	3,120	0.40	0.226
200	1,000	63	38	35	20.9	19.25	16,350	17,750	2,270	870	0.165	0.065
400	1,000	63	42.8	37.6	23.5	20.7	14,500	16,500	4,120	2,120	0.299	0.1535
600	1,000	63	45	39.5	24.7	21.7	13,820	15,720	4,800	2,900	0.348	0.21
1,200	1,000	63	49	41.5	26.9	22.8	12,700	14,970	5,920	3,650	0.43	0.257

value, which is 750-850 deg. Where 400 lb. and 750 deg. superheat have been tried out, the only prominent troubles have been with the steam-chest or nozzle box. Proper design will obviate most of the troubles. Cast or forged steel must be the material used.

In general, the turbine designers say that 1,200 lb. to 1,500 lb. pressure has no terrors for them and can be used when desired. Temperatures are more troublesome, and no one apparently cares to go much above 700 deg. to 750 deg. at the present time. Superheater and valve materials at present seem to be the deciding factor in the use of high pressures and temperatures, and there is apparently very little which careful design and the selection of proper materials will not overcome.

Only a portion of the central-station installation is affected by high pressures and temperatures, especially where electric auxiliaries are used. The boiler and piping system and prime mover cover the whole list, and in the usual central station this has represented about 40 per cent of the entire installation cost. Lately, with the larger station, the percentage is around 30 and may be taken at 25 per cent for the newer and larger stations of which Hell Gate and Calumet are types. If unit station cost be taken at $100 per kilowatt as an average figure, the portion of the installation cost attributable to the boiler piping system and prime mover is $25. At 15 per cent the fixed charges are $3.75 per year, or 0.07 cent per kilowatt-hour, based on 5,000 hours' operation per year.

What, then, will be the extra cost of apparatus designed for higher pressures and temperatures? Standard boilers today can be bought up to 275 lb. pressure. Pressure of 300 lb. necessitates thicker plates and tubes, and prices advance accordingly. Boilers rated at 400 lb. have been purchased recently, and 500-lb. boilers have been built. Flash boilers of the Serpollet and De Laval types, using pressures in excess of 1,200 lb., and coil boilers of the Herreshoff type, using equally high pressures, have been built for automobile work or high-speed launches. Schmidt's water-tube boiler working at 900 lb. has been run 14,000 hours with marked success. Boilers for 400 lb. pressure have been offered at about 50 per cent increase in price, and 1,200-lb. boilers have been figured at a 100 per cent increase in price.

Turbine designers are at work on designs arranged to utilize higher pressures, but they are fighting shy of higher temperatures. No estimates are available, but it is safe to apply the same percentage increase of price to the turbine that obtains with the boiler. Steam piping decreases in size with increase in pressure, so much so that it is doubtful if a 1,200-lb. steam line would cost more than a 200-lb. line of the same capacity. The volume of high-pressure steam at 1,100 deg. maximum temperature is quite uncertain, but the chances are that the foregoing figures are not more than 10 per cent from correct.

In concluding it may be said that pressures up to 1,500 lb. are commercially obtainable without serious difficulty. Temperatures above 750 deg., which is now commercially obtainable, should not be exceeded until the material for valves and superheaters are improved. More extended experience is necessary before temperatures of 800 deg. and over are attempted.

With the completion of steam table research it will be possible to calculate accurately just where the possible limits of economy in pressure and temperature may be placed. At the present time the uncertainty of all values above 200 lb. pressure and 400 deg. F. render most calculations of only academic value.

Rather than attempt to obtain the greatest plant economy through use of higher pressures and extension of temperature ranges in heat cycles, it would be more effective and expedient to study carefully how existing heat losses in present installations may be reduced to the lowest limits.

Installing Pit-Shaft Cables

Advantages and Disadvantages of Various Methods—Cable Joints a Source of Trouble—Rules for Inspection

FROM A CORRESPONDENT

HAVING regard to the abnormal conditions to which a shaft cable is usually exposed, the protection both from mechanical damage and from that due to the corrosive nature of some pit water generally receives special consideration. The best practice is to provide double armoring in order to afford protection from falling materials. The armoring should also be well protected from the corrosive action of water by a double-jute serving, which should be periodically treated throughout the entire length of the cable with Stockholm tar or an equivalent, in order to preserve the jute. This should be done in two or perhaps three years, depending upon local conditions.

A factor which must always be taken into consideration when a cable has to be fixed to a shaft wall is that ample space must be allowed at all points between it and the cable, in order that falling objects may to some extent be prevented from crushing the cable against the wall and that the cable itself may be as resilient as possible.

Moreover, the cable cleats should be provided with shields at the top to prevent accumulation of dirt around the cable where it enters the cleats. This shield also serves to deflect falling material which might otherwise injure the cleats. Every care should be exercised to avoid damage to the jute covering as a result of rubbing against walls or girders while being lowered into its place. Further, discretion must be used in making temporary fastenings to the cable for the purpose of lowering it or in connection with any other method which may be necessary to get it into position.

EQUIPMENT AND DEPTH AFFECT INSTALLATION

The different equipments usually met with in pit shafts may be briefly summarized as follows:

1. Those in which rail guides are fastened to girders placed in either side of the shaft.
2. Those provided with rail guides fastened to girders placed down the center line of the shaft.
3. Those for which rope girders are provided.

Method 1.—Lowering Cable Down from the Drum of a Capstan Winding Engine.—This is perhaps the ideal method of getting a cable down, from the point of view of labor as well as of time. It consists in making the cable end fast to the cap of the winding engine or capstan rope and coiling it on the drum, after which the end of the cable is fed over a suitable pulley into the shaft and the end guided by the pitmen from a box lowered by some other means at the same speed as that of the cable. One important consideration, however, must never be overlooked; i.e., will the length and weight of cable to be lowered be such as to cause injury by its own weight being suspended by one fastening?

This will obviously depend on the size of the cable, its length and construction. For instance, a lead-covered and armored cable is much heavier than one of the bitumen-insulated type. To be on the safe side in this respect, it is always advisable to consult the makers before lowering a cable in this way, in order to ascertain their views after giving them full particulars of the method suggested. If the cable cannot be lowered in one length, the lower length or lengths necessary have to be suspended during the process of lowering, with the whole weight hanging and depending on a suitable clamp or capel, to which the winder or capstan rope is attached.

If possible the lower end of the capel should be tapered in order that it shall be less likely to catch on obstacles encountered in its passage through the shaft. Having secured a suitable capel to the cable end, the capstan rope, assuming that one is used for the purpose, should be attached and the cable carefully coiled on to the drum over a bedding of sacking or other material, which should serve the purpose both of protecting the cable from the hard surface of the capstan rope already coiled on the drum and of providing a more or less uniform surface on which to coil the cable. A suitable pulley must be erected at the pit top and so arranged that a line dropped from the groove overhanging the pit shaft will fall where the cable is to be fixed, but clear of shaft equipment against which the cable might rub and damage its jute covering. The pulley groove should be large enough for the cable to be in the bottom without being exposed to a crushing side pressure when the weight gets on. Further, a layer of soft hemp fastened in the groove is an additional protection. The brackets in the shaft should have all covers removed before any attempt is made to lower the cable, which should not be allowed to hang from its clamp longer than is absolutely necessary.

PITMEN GUIDE CABLE

When everything is in readiness the pitmen should be lowered at the same time as the cable, guiding the end past any obstacle in its path and also keeping it in the course intended. When a cable has to be lowered in two or more lengths, it is necessary that the lower ones should be let down with great caution, especially after the end of the cable which is fastened to the winding or capstan rope enters the shaft. No matter how ingenious the design of clamp employed for holding the cable may be, there is always a possibility of its catching, and should this occur, allowing the descending rope to lose the weight of the cable, a serious accident might result through the obstruction to the cap giving way and allowing the full weight of the cable to fall for some yards. This would be sufficient in many cases to strain the cable severely, if not to cause it to break away.

The method to follow is to ascertain roughly the distance the bottom end of the cable can be safely lowered unattended without going out of its course or being obstructed. Then the pitmen should be raised until they are level with the upper end of the cable and in a position to guide the cap where necessary. After lowering the cable the prearranged distance, the pitmen should again be lowered to the end of the cable and preparations made for a further lowering as soon as they have again been brought to the upper end. These operations must be continued until the cable is finally in the desired position.

It is always advisable to have the cable fastened into most of the brackets before slackening out the capstan rope, as by this means the weight is now more or less distributed over the whole length of the cable, which toward its upper end is naturally under a greater stress than are the lower portions. Although in most cases this is not a serious matter, yet in some instances, owing to special circumstances, it may be desirable to relieve the cable of all strain. To effect this a few of the lower brackets should be fastened and then made to take their share of weight by lowering the cable ever so slightly, in order that the weight then hanging will be that of the cable less the lower portion already fastened. This might be repeated two or three times in sections up through the shaft and so relieve the cable from all strain.

Method 2.—Pulling Cable Up from the Pit Bottom.—This method is a very convenient one, provided that the cable drum can be taken to the pit bottom. Once there it is placed on a strong bar resting between two substantial supports so that the drum can rotate. A capstan rope is then lowered and connected by a suitable fastening to the cable end, which is pulled up the shaft while it is watched by pitmen who should accompany the ascending cable on top of the cage in order to prevent its getting caught in obstacles.

MANUFACTURERS ADVOCATE LASHING

Method 3.—Lashing Cable to Capstan Rope.—This is the method usually advocated by cable manufacturers as, provided it is properly carried out, the operations are fairly safe and the cable is got into place without fear of straining due to hanging by its own weight. However, a great deal more skill is required, and incidentally much greater patience, while mishaps are more likely to occur than in some other methods of installing.

In this method a capstan rope is needed as before, but instead of fastening the cable end to the rope and suspending it by its end, both cable and rope are fed into the shaft at the same time. Rope lashings are made from the cable to the capstan rope every few yards and serve to support the cable. As mentioned above, considerable skill is required in making good fastenings to the cable and rope; without them the cable may slip down the rope and pull the cable drum and everything else with it.

The chief objection to this method is the possibility of the numerous lashings becoming caught here and there in the shaft and thus caused to slide up both cable and rope until long lengths of cable remain unsupported. Further, the lashings do not readily slide along the rough cable jute, so that the jute becomes torn and perhaps stripped for long distances, thus exposing the cable to the effects of pit water. Moreover, one of the objections to this method is the enormous amount of time required to put down a cable. It would not be wide of the mark to say that from the commencement of operations methods 1 and 2 can be carried out in less than half the time required for the method that has just been described.

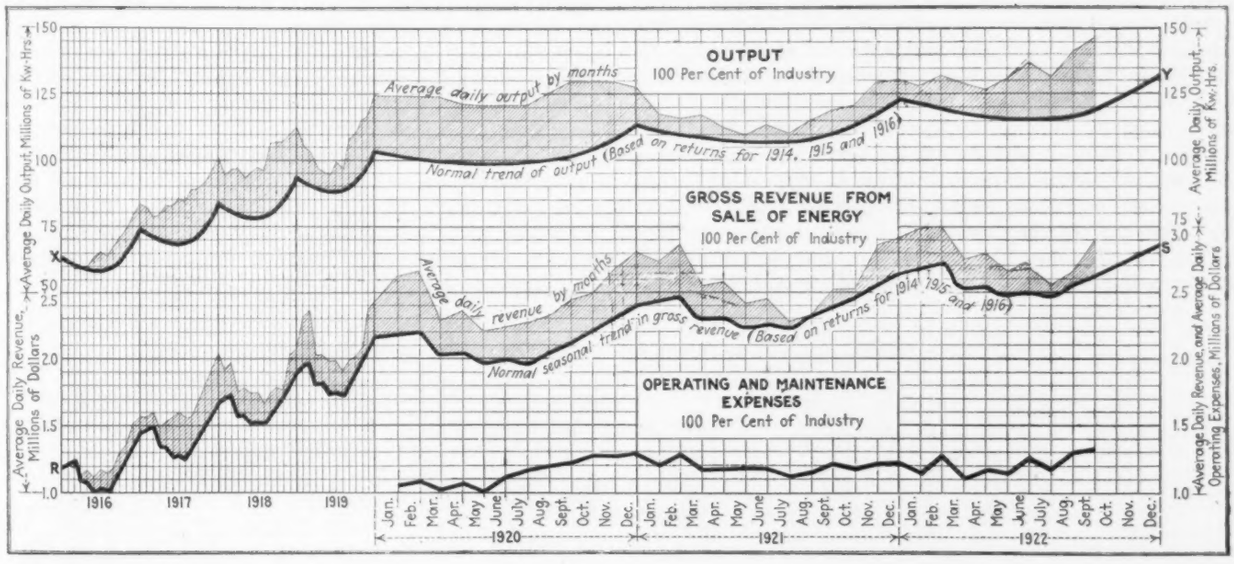
Method 4.—Cable Drum Slung on Cage.—The foregoing methods of installing shaft cables are obviously applicable to almost any kind of shaft, but in cases where it is not convenient to use a capstan, and where rope guides exist, a very successful way, and one which is quickly carried out, is to erect the cable drum between the bridles of the cage and slowly revolve the drum and

pay off onto the shaft brackets as the cage is gently lowered. Where this is done it is usually necessary to use for the purpose extra long bridles or cage chains so as to allow room to erect the drum in the angle between the rope cap and the carriage.

Where a cable is too long to be put down in one length it is necessary to make joints, which should, if possible, be in headings rather than on the shaft wall. This is advisable in order to have a dry place for the making of the joint as well as for its permanent position, and in the second place, the joint is thus protected from falling material, while overheating or other troubles can more readily be attended to. However, where no heading is available it is necessary to fix the joint or joints on the shaft wall or other suitable position. In such a case a vertical type of box might be used, but joints of any kind are most objectionable in pit shafts and should be avoided. At all points below the surface where pit cables enter or leave the shaft adequate provision should be made to protect them from falling material which might cause injury. Suitable stout wooden coverings should be fixed to the shaft wall and project beyond and surround the cables, which should pass through the covering before bending to enter the heading or other opening.

Shaft cables should be examined by the electrician at least every three or six months, depending on circumstances. This inspection should be carried out from the top of the carriage by the aid of a good light in order that defects may be easily noticed. Broken jute covering and the avoidance of collections of dirt around cables entering brackets are the chief things that usually require attention, but more serious damage should be always anticipated and looked for.

Record Energy Sales During September


OUTPUT
100 Per Cent of Industry
Average daily output by months
Normal trend of output (Based on returns for 1914, 1915 and 1916)
GROSS REVENUE FROM SALE OF ENERGY
100 Per Cent of Industry
Average daily revenue by months
Normal seasonal trend in gross revenue (Based on returns for 1914 1915 and 1916)
OPERATING AND MAINTENANCE EXPENSES
100 Per Cent of Industry
Average Daily Output, Millions of Kw-Hrs.
Average Daily Revenue, Millions of Dollars
Average Daily Revenue and Average Daily Operating Expenses, Millions of Dollars
1916
1917
1918
1919
1920
1921
1922

REPORTS received by the *Electrical World* for the month of September from central generating and distributing companies representing 83 per cent of the installed generator rating of the country indicate that two new records were hung up by the industry during September. So many records have been superseded during the year 1922 that it has become a matter for inquiry if a month passes without a new record being set in some phase of the electric light and power industry. The total sale of energy during September was 4,400,000,000 kw.-hr., which exceeded the former high monthly figure set during August by 14,000,000 kw.-hr., although September had one less day than August. The average daily output was 146,696,000 kw.-hr., which exceeded the previous record made during August by 5,071,000 kw.-hr. and the output reported for September, 1921, by 22.5 per cent. If this growth were continued, the industry would double its present operations by 1928.

Final government reports indicate that general manufacturing activity declined somewhat during the month of September. Out of fifty-two commodities reporting, eighteen showed increased production compared with August, thirty declined and four showed no change. Many of the declines reported in September were small, while others were purely seasonal reactions. It is probable that the consumption of electrical energy by manufacturing industries of the country was about on a par with that of August. The underlying cause, therefore, for the increase in sales of electrical energy during September was undoubtedly the advancing season, reflected in increased lighting energy requirements plus consumption of such new industrial power customers as were added to the lines during the month. The advancing season, however, also had a slight adverse effect on the activities of the electric light and power industry, especially in the West. The irrigation load plays a large part in the business of companies operating in the Mountain and Pacific States, and practically every generating and distributing company serving these sections reported slightly decreased operations during September. The effects of this seasonal decline in the irrigation load probably will be felt more keenly in the reports for October operations.

The gross revenue of the industry also showed a decided upward swing during September, probably a direct

TABLE I—CENTRAL STATION RETURNS FOR THREE MONTHS

Mos.	Percentage of Installed Ratings Represented	Kw.-Hr. Output (Companies Reporting) 1922 Thousands	1921 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	Revenue from the Sale of Energy (Companies Reporting) 1922 Thousands	1921 Thousands	Per Cent Increase
July...	83	3,401,789	2,823,231	20.4	76	$60,392	$54,442	10.9
Aug..	83	3,644,111	2,985,881	22.0	76	62,869	55,487	13.3
Sept..	83	3,652,773	2,981,396	22.5	76	66,371	57,938	14.6

Mos.	Percentage of Installed Ratings Represented	Operating and Maintenance Expenses (Companies reporting) 1922 Thousands of Dollars	1921 Thousands of Dollars	Per Cent Increase	OPERATING RATIO Steam Plants 1922	1921	Hydro Plants 1922	1921	Combined Systems of Steam and Hydro 1922	1921
July..	62	23,006	21,556	6.7	55.3	56.8	27.9	28.5	46.1	48.1
Aug..	62	24,967	22,315	11.9	56.6	54.2	26.8	31.4	48.8	50.7
Sept.	62	24,555	22,245	10.3	53.4	53.2	26.4	25.8	46.9	48.3

reflection of the increased high-revenue lighting load. An average daily revenue from the sale of energy of $2,906,000, while almost $300,000 above that reported for August, was about $100,000 under the peak revenue reported during last February. For the next four months new records in gross revenue from sale of energy may be expected in every section of the country.

Expressing the financial phase of the returns in terms of the operating ratio, or ratio of operating expenses to gross revenue from sale of energy, shows that financially the industry is very close to the same position it occupied this time last year. The operating ratio reported for September by companies having steam plants only, taken in the aggregate, was 53.4 per cent against 53.2 per cent for September of last year. Although in January the operating ratio for these same companies was only 45.7 per cent, such an increase in operating ratio between winter and summer months is to be expected on account of the relatively higher percentage of low-revenue industrial energy sold during the summer months. During the present year must also be added the higher price of coal in September as compared with January. A very favorable indication, however, is the fact that the operating ratio during September was 3.2 per cent below that reported for August. It is evident that the operating ratio reached its highest point during the present year in August. If the normal trend is followed, the operating ratio should continue to decrease as the large winter load approaches, and the lowest point should be reached in December or January, when the high revenue load is at its peak.

Electricians on German Vessels

THE electrical equipment on German vessels is extensive and of complicated character, concentrated in a small room. Ships equipped with electrical apparatus are often away from their home ports for several months. When a vessel is at sea the ship's electrician becomes a very important factor in the operation of the vessel and its movement and safety are often greatly dependent on his technical ability. There is a plan on foot in Germany, according to Harry J. Anslinger, United States Vice-Consul at Hamburg, to advance the ship's electrician to a position equivalent to his importance and to amend the seaman's law to give him the title of a ship's officer. It has also been suggested to provide an electrotechnical school for ship's electricians.

TABLE II—CENTRAL-STATION RETURNS BY SECTIONS OVER A THREE-MONTH PERIOD

Month	New England States: Percentage of Installed Ratings Represented	1922 Thousands	1921 Thousands	Per Cent Increase	Atlantic States: Percentage of Installed Ratings Represented	1922 Thousands	1921 Thousands	Per Cent Increase	North Central States: Percentage of Installed Ratings Represented	1922 Thousands	1921 Thousands	Per Cent Increase	South Central States: Percentage of Installed Ratings Represented	1922 Thousands	1921 Thousands	Per Cent Increase	Pacific and Mountain States: Percentage of Installed Ratings Represented	1922 Thousands	1921 Thousands	Per Cent Increase
KW.-HR. OUTPUT:																				
July	82	227,799	193,144	17.9	83	1,180,488	970,398	21.7	82	1,114,357	911,543	22.3	63	166,374	142,407	16.8	95	712,771	605,739	17.7
Aug.	82	260,666	214,944	21.4	83	1,275,186	1,026,388	24.3	82	1,176,589	972,551	21.0	65	179,325	150,412	19.3	95	752,345	621,586	21.0
Sept.	81	262,920	225,222	16.7	82	1,308,060	1,034,936	26.4	81	1,170,392	976,454	19.8	64	192,090	155,684	23.3	97	719,311	589,100	22.2
REVENUE:																				
July	82	$5,729	$5,301	8.1	76	$21,867	$19,903	9.8	68	$18,709	$16,411	13.9	63	$4,036	$3,716	8.6	95	$10,051	$9,111	10.3
Aug.	82	5,968	5,415	10.2	76	22,586	19,991	13.0	69	19,702	16,760	17.6	65	4,201	3,881	8.2	95	10,412	9,440	10.3
Sept.	81	6,334	5,751	10.1	76	24,506	20,946	17.0	68	20,491	17,590	16.8	64	4,454	4,022	10.7	97	10,586	9,629	9.9
OPERATING EXPENSES:																				
July	53	$1,783	$1,765	1.0	57	$7,769	$7,361	5.5	55	$7,923	$7,175	10.4	62	$1,961	$1,966	−0.2	94	$3,570	$3,289	8.5
Aug.	53	2,003	1,973	1.5	58	8,202	7,412	10.6	55	8,943	7,363	21.4	64	2,182	1,990	9.6	94	3,637	3,577	1.6
Sept.	53	2,030	2,100	−3.3	56	7,624	7,322	4.1	55	8,945	7,289	22.7	63	2,280	2,017	13.0	96	3,676	3,517	4.5

TABLE III—AGGREGATE OPERATING RATIO OF COMPANIES REPORTING DATA MONTHLY TO THE "ELECTRICAL WORLD"

Type of Generating Plant and Month	New England States 1922	1921	Average for Previous 12 Months 1922	1921	Atlantic States 1922	1921	Average for Previous 12 Months 1922	1921	North Central States 1922	1921	Average for Previous 12 Months 1922	1921	South Central States 1922	1921	Average for Previous 12 Months 1922	1921	Mountain and Pacific States 1922	1921	Average for Previous 12 Months 1922	1921
Steam Plants:																				
July	54.3	62.4	56.3	64.5	56.2	57.3	50.3	55.9	56.7	55.8	51.8	59.3	51.9	53.9	49.7	54.9	49.7	52.6	48.0	54.4
August	57.8	64.3	55.6	63.8	57.7	52.0	50.4	55.3	58.6	55.7	51.8	58.1	51.8	53.3	49.4	54.7	48.3	51.8	47.7	53.8
September	56.8	60.2	55.6	62.8	53.3	53.2	50.5	54.8	55.8	52.3	51.7	57.4	50.1	52.5	49.1	54.1	44.2	45.9	47.6	53.0
Hydro Plants:																				
July	40.6	49.9	34.4	43.8	24.5	22.1	20.5	23.4	20.5	26.0	22.6	22.9	50.2	47.8	42.1	39.6	28.2	28.1	27.3	26.9
August	35.1	39.8	34.5	43.6	23.6	22.7	21.2	23.6	26.0	25.9	23.2	23.2	37.1	33.8	42.2	39.9	27.5	31.3	27.6	27.5
September	36.3	31.6	34.8	44.2	19.8	21.4	21.4	23.6	30.0	30.4	23.9	24.0	45.2	27.6	42.6	40.1	27.5	27.1	27.8	27.8
Combined Systems of Steam and Hydro Plants:																				
July	53.2	56.7	51.6	52.1	51.3	52.0	46.7	50.0	54.8	56.3	48.9	54.6	41.2	48.4	42.9	46.1	30.5	33.6	35.3	39.0
August	58.9	64.4	51.6	52.0	53.3	59.8	47.5	51.3	58.1	56.6	50.3	54.5	43.8	45.2	42.8	45.7	31.1	35.3	34.6	38.2
September	55.8	65.6	49.9	52.1	47.8	50.9	47.4	51.3	56.2	54.4	51.0	54.1	51.0	42.3	43.5	45.6	31.8	34.7	34.1	37.1

Electric Steam Boilers for Using Surplus Water Power

High Efficiency, Negligible Attendance, Small Floor Space and Flexibility of Operation—Relative Merits with Essential Requirements

MUCH has been heard lately of the development and the rapid popularization of electrically heated steam boilers in Europe. Especially in countries lacking adequate national deposits of coal or fuel oils but having an abundance of water powers have these boilers gained ground rapidly. The most efficient utilization of an existing water power can be achieved only if the demand for power corresponds to the supply, which is very rarely the case. When ice and snow are melting in the spring—and during the night hours of every day—surplus energy is available for which there is seldom a use. Storage batteries, especially for alternating-current systems, are very inefficient, and hydraulic accumulation requires a high investment and is not always possible.

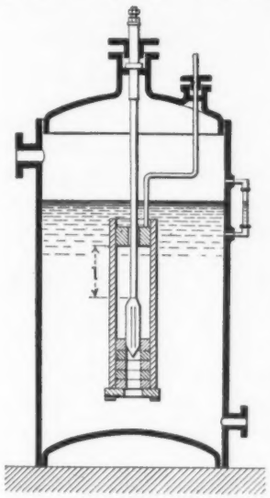


FIG. 1—SINGLE-PHASE SMALL ELECTRODE BOILER. HEAT INSULATION NOT SHOWN

The electrically heated steam boiler is an almost ideal solution of this problem, says a recent issue of the *Hackethal Nachrichten*. One kilowatt-hour gives theoretically 860 calories, or with an average practical efficiency 1.25 kg. (2.75 lb.) of steam. Assuming a five-fold evaporation, 1 kw.-hr. is equivalent to 0.25 kg. (0.55 lb.) of coal. If a plant has available a surplus energy of, say, 1,000 kw. for eight hours a day, an electrically heated boiler will save daily 1,000 × 8 × 0.25 or 2,000 kg. (4,410 lb.) of coal.

Among the many advantages of these boilers are their high economy, the negligible amount of necessary attendance, the small floor space occupied, the absence of a chimney, reduced possibility of explosion (as low water has no effect upon the operation of the boiler) and the instantaneous starting or stopping of the heating process. The simplicity and safety are such as to permit installing such a boiler in a remote part of any plant, thereby economizing on long and ineffective steam lines.

Storage of the generated steam will frequently be necessary, and for this purpose an existing coal-fired boiler may usually be adapted easily, in which case an average over-all efficiency of about 85 per cent may be reached. Based upon this figure, a definite relation exists between the cubic meters of storage water necessary for a certain number of kilowatt-hours at given charging and discharging pressures. For example, 1 cu.m. (35 cu.ft.) of water will store 56 kw.-hr. if charged with 12 atmospheres and discharged with 4 atmospheres.

Three different methods of heating the water are available—the indirect, the direct and the electrode system.

For small boilers and for direct current the indirect-resistance method is the only possible form, says the *Hackethal Nachrichten*. It consists of heating units sealed into tight metal containers, which are submerged into the water of the boiler. This type has the advantage that it can be used on either direct or alternating current. Even for the latter, for voltages under 500, it is much cheaper than the electrode system. As a rule the unit is divided into a number of sections, so as to give several steps of heating by group connections of the units, or by star-delta connections in case of three-phase supply.

DIRECT-RESISTANCE METHOD

The direct-resistance method is suitable for all sizes of boilers and for alternating currents of between 110 volts and 1,000 volts. The resistance wire is in direct contact with the water of the boiler. For medium size and large boilers the resistance required for the heaters within the given voltage limits is usually less than 1 ohm. If in such a case the electrode principle were to be used instead, the slightest amount of scale upon the electrodes would change the resistance very appreciably and an unreliable and irregular service would ensue. Direct current cannot be used for this type because the conducting water would form a shunt across the resistor, which would result in the generation of a highly explosive mixture of hydrogen and oxygen. The earlier constructions of boilers of this class consisted usually of a horizontal drum boiler, to which were attached on either side a number of vertical tubes with concentrically arranged heating units in which the actual boiling took place. In more modern designs the heating elements are mounted directly in the main boiler. The unit itself is made of a special non-rusting round alloy wire (chrome-nickel) wound non-inductively upon a core of ceramic material. The wire will stand safely and permanently temperatures as high as 1,200 deg. C. so that its operation is quite safe, even in the case of complete embedding into scale. For voltages above 500 a tube of ceramic material is slipped over the resistor to minimize the shunting action of the water.

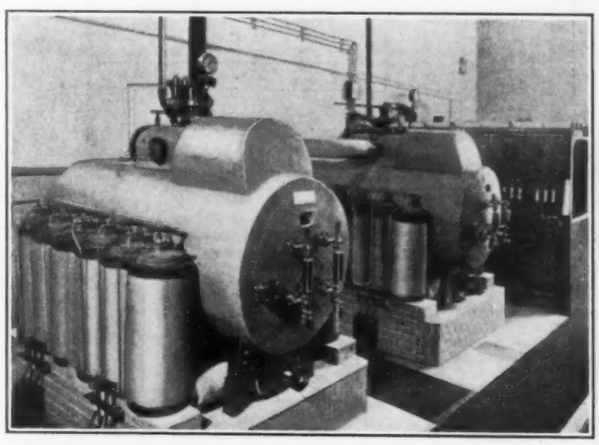


FIG. 2—DIRECT-RESISTANCE METHOD BOILER WITH FIVE BOILING UNITS ON EACH SIDE CONNECTED TO THE MAIN TANK. CAPACITY 1,000 KW.

A 1,000 kw. boiler of this type, with five heaters attached to each side, connected to a 532-volt, three-phase system, produced 1,475 kg. (3,250 lb.) of saturated steam per hour under 5.8 atmospheres pressure

in actual service. This corresponds to a boiler efficiency of 97 per cent. (See Fig. 2.)

If high-voltage alternating current is available for boiler heating, the electrode heating method is the most advantageous, provided the voltage is not higher than about 15,000. The resistance method is impracticable for two reasons—the shunting action of the water is too great and the high resistance required for the high potential would necessitate the use of so small a wire as to be mechanically too weak. The water in the boiler being the resistance itself, it is of utmost importance to know its specific resistivity in order to provide a suitable electrode distance and electrode surface. Water from different localities shows greatly varying resistances. The limits may be between 3,000 ohms and 10,000 ohms per cubic centimeter (0.06 cu.in.). To this comes the very decided increase of resistance with increasing temperature. Wide possibility of regulation is therefore very essential for a boiler of the electrode type. It is also of importance to avoid too much scale formation on the electrodes in order to prevent overheating and possible arcing at the electrodes. Experience has shown that the maximum deposition of scale occurs at the points of the maximum evaporation, caused by the number of watt-seconds energy transformers in 1 cu.cm. of water. To avoid, therefore, scale formation on the electrodes it is essential to locate the energy transformation as much as possible away from the electrodes. Displacement pieces, made of insulating material, are therefore arranged along the path of current flow, providing passages of such length and cross-section as to enforce the maximum energy transformation in these places. (See Fig. 3.) This will leave the electrodes as mere entrance and exit points for the current. It is of greatest importance to observe this detail in the design of an electrode boiler, as the safety of its operation depends largely upon the proper arrangement of the electrodes.

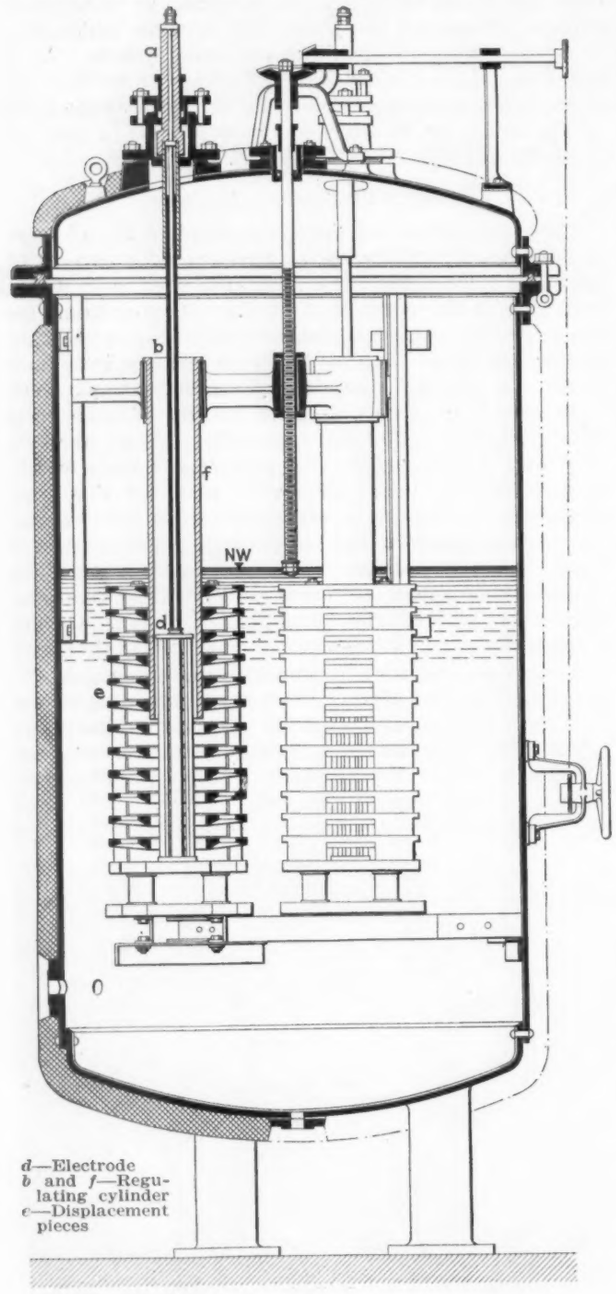


FIG. 3—THREE-PHASE LARGE ELECTRODE BOILER

Another vital point is the right dimensioning of the electrode surface. In a similar way, just as there is a maximum current for a certain metallic wire cross-section, exceeding which the wire will melt, there is also only a limited current density permissible for water as a conductor. If this maximum is exceeded, the current will no longer flow steadily through the water, but will be intermittently made and broken. Use of this fact is being actually made in the electrolytic interrupter for X-ray spark coils. If through a faulty design or an excessive overload this condition occurs in practical service, a total destruction of the boiler may result.

CALCULATING CURRENT DENSITY

The method of calculating the safe maximum permissible current density is based upon the determination of the voltage distribution in the water between the boiler electrodes. From the hyperbolic curve "volts per cm. distance" can be calculated the resistance capacity, which will be a further function of the diameter of each electrode. The calculation will be made somewhat unsafe by the complications introduced by layers of hot water of different degrees of heat and by the admixture of steam bubbles to the water, both of which affect the resistance of the water considerably.

The concentric arrangement of electrodes (rod within a cylinder) is difficult for voltages over 1,000. Individual electrodes placed parallel or, for three-phase boilers, at the points of an equilateral triangle give best results for high voltages. To regulate the input the electrodes may be arranged so as to dip them more or less deeply into the water, or, better, an insulating concentric cylinder may cover a smaller or greater part of the electrode. (See Figs. 1 and 3.)

It may be mentioned finally that a three-phase electrode boiler represents an ideal overvoltage protector, as the lines are grounded over a relatively small resistance. The theoretically required resistance for a damping grounding resistor is equal to $r = \sqrt{\frac{L}{C}}$, or about 30 ohms to 50 ohms for a cable. A 500-kw. to 1,000-kw. boiler connected to a 5,000-volt cable will give just the right amount of grounding resistance to take care of all switching overvoltages.

Commercial Aspects of "Change-Overs"

The Replacement of Direct-Current with Alternating-Current Equipment Should Be Thoroughly Planned and Carefully Executed to Minimize Cost and Avoid Misunderstandings with Customers

By F. S. ROOT

Power Engineer and Commercial Manager Fall River (Mass.) Electric Light Company

MANY small and medium-size central-station companies which are still supplying customers with direct-current service in limited districts would long ago have changed them over to alternating current had it not been for the uncertainty of the expense involved. There have been instances where "change-overs" have been entered into without making a complete survey of the situation and numerous unpleasant misunderstandings have resulted. The value of a complete preliminary survey, therefore, cannot be overestimated. In this article Mr. Root makes some pertinent suggestions which can be profitably followed in changing from direct to alternating current. He points out the stumbling blocks which can be largely avoided if the change-over is carefully planned and properly carried out.

WHEN a central-station company decides to change over a whole or a part of its direct-current system to alternating current — and it takes no little courage to arrive at this decision — there are still a good many problems to face. First of all, the company must decide upon what financial basis the exchange of customers' apparatus will be made. Several schemes have been tried out, ranging from an even exchange of equipment and changes in interior wiring at no expense to the customer to an arrangement whereby the customer is allowed only the market value of the goods replaced and is charged for any alterations in interior wiring made necessary by the change.

Company Shall Stand Cost

From personal experience the writer is in favor of all expense of the "change-over," of whatever nature, being borne by the central-station company, principally because it is the fairest thing to do, and also because it causes less friction between the company and the customer. After all, the change-over is being made at the company's desire, not the customer's, who is probably very well satisfied as he is. Besides, no matter how carefully the change is planned, some interruption in service is unavoidable and some "muss and fuss" will have to be made in the customer's premises. This is especially true in stores and in doctors' and dentists' offices. In some cases, such as passenger elevators, printing presses and cash-carrier systems, direct current is actually preferable to alternating, and it is very difficult to give the customer as good and as quiet service with alternating current as he enjoyed with direct current.

It may seem rather hard on the central station to have to give a brand-new motor or fan for an old piece of "junk," apparently only fit for the scrap heap. Even so, many customers will be found who will claim in all sincerity that the new piece of apparatus is not nearly so good as the old one taken away and which had served so well year after year.

Wiring Important Item

Changes in interior wiring are more serious than may at first appear. When direct-current motors are replaced by three-phase apparatus one new wire must be run, and since the old wiring was very often put in years ago, when requirements were not so strict as today, all wiring may have to be revamped.

Many mechanical difficulties may also have to be overcome. In the case of cash-carrier systems, for instance, very low-speed direct-connected motors are generally used, and it is impossible to get an alternating-current motor which will operate at anywhere near this low speed, so that some mechanical changes are necessary to allow for the use of belt drive. The belted alternating-current motor is always a good deal noisier than the direct-current, direct-connected machine was and as the motor is usually installed in the cashier's cage, the customer may insist on a sound-proof box over the motor before he is at all satisfied.

In changing over organ-blower motors it is almost always advisable to cover them with a properly ventilated sound-proof box to deaden the hum, which will be quite audible in the body of the church when the organ is playing softly unless some means of muffling the sound is used. Oftentimes the construction of this box costs as much as the new motor, since it is necessary to match the woodwork of the church wall paneling.

Difficult Cases

Unfortunately for the central station, the most expensive changes of apparatus often come in places that pay the least revenue, such as the offices of medical specialists and dentists. If a dentist has an X-ray machine, a couple of dental engines, two or three lathes and desk fans, and so forth, it may cost several hundred dollars to change this equipment over, although he may use but $25 worth of energy in a year. Eye, ear and throat specialists are also costly customers to take care of, while passenger elevators and newspaper plants will cost one or two thousand dollars each before the change is completed. Photographers' and engravers' arc lamps are expensive things to exchange, and the customer is generally dissatisfied even after you have done your best for him.

The value of the direct-current equipment taken out is discouragingly low, and if a part of the direct-current system is changed over it is better to wreck all apparatus and sell it for junk. If this is not done, a great deal of it will somehow find its way back on your lines

again and you will have to exchange the same piece of apparatus more than once no matter how careful you are. And this recalls another word of warning. Keep your intentions as to making the change-over quiet as long as possible. If you don't, unscrupulous dealers will conspire with equally unscrupulous customers to obtain new alternating-current equipment.

In one instance where the change-over was announced prior to commencing the actual work a dental supply company furnished a dentist's office a few weeks before the change with two old dental engines and three old direct-current dental lathes, over and above the dentist's regular equipment, and thus the dentist procured some brand-new alternating-current equipment for practically nothing. A few weeks after the exchange the new alternating-current equipment had disappeared from the dentist's office and presumably had gone to the dental supply house's stockroom.

Desk and ceiling fans are another thing that customers will stock up on before their turn comes to be cut over to alternating current, and old fans that had lain in the junk pile for years have been resurrected by unscrupulous jobbers and placed in various customers' offices to be exchanged for nice new fans.

MAKE PRELIMINARY SURVEY

To prevent this as far as possible, it is well to make a preliminary survey of the territory to be changed over, checking up all equipment which will not operate on alternating current and have the customer then and there sign a form of inventory of his direct-current apparatus, stating that it includes all the equipment that he has in his possession which needs to be changed and that he will purchase no more direct-current equipment without first consulting the company. The company signs the same form, which is in duplicate, stating that it will, at no expense to the customer, exchange the old apparatus for new apparatus of similar description. One form which has been used reads as follows:

AGREEMENT TO CHANGE CUSTOMER'S APPARATUS FROM DIRECT TO ALTERNATING CURRENT

This agreement made in duplicate this day of , 1921, by and between the Blank Electric Light & Power Company, hereinafter called the company, and the Brown & Smith Dental Company, hereinafter called the customer, witnesseth as follows:

FIRST—The company proposes to change its direct-current system to alternating current, which will make it necessary to change some of the apparatus which its customers now have connected.

SECOND—The customer now has installed in premises at 83 South Main Street, South Warburton, Mass., the following direct-current apparatus which is to be changed.

One (1) stationary vacuum cleaner, belted to 1 hp., 1,720 r.p.m. motor pulley, 3 in. x 3 in.
One (1) "Electro" dental engine.
One (1) X-ray machine (dental size).

THIRD—The company will furnish and install the following alternating-current apparatus in exchange for the direct-current apparatus as listed above.....at no cost to customer:

One (1) 1-hp., 220-volt, single-phase Wagner motor, 1,800 r.p.m., with 3 in x 3 in pulley, for vacuum cleaner.
One (1) "Electro" dental engine (engine head only to be changed).
One (1) Ritter dental lathe with chucks.
One (1) X-ray machine of same size and type now used.

FOURTH—The above is a full and complete list of all direct-current apparatus now in the possession of the customer which is to be changed, and it is understood and agreed that no additions or changes shall be made in this apparatus without first notifying the company, and such additions and changes shall be made entirely at the customer's expense.

FIFTH—The company will, upon the execution of this agreement by the customer, take immediate steps for the completion of this change and use all reasonable measures to give uninterrupted service during the change-over period and not to inconvenience the customer.

IN WITNESS THEREOF the parties have caused these presents to be signed the day and year first above written.

BLANK ELECTRIC LIGHT & POWER COMPANY,
(*Signed*) BY H. E. GREEN, President.
BROWN & SMITH DENTAL COMPANY,
(*Signed*) BY R. S. BROWN.

STORY OF A DOCTOR

There is one word of warning to append to this kind of agreement. In it appears the following sentence: "The company will furnish and *install* the alternating-current apparatus, etc." The word "install' nearly caused one company a lawsuit. A certain doctor had a direct current X-ray machine, and when the matter of the change of apparatus to alternating current was investigated he asked that a more powerful machine be put in, the difference in cost over that of a machine of the same size as his old one being very little. This the company agreed to do. However, when the new X-ray machine arrived and was put in place the current requirements were found to be so much greater than for the old one that heavier circuits from the basement to the fourth floor where the office was located were required.

The company felt that, as it had been good enough to provide the larger machine as requested, the least the customer could do was to stand the expense of the wiring change and also held that the word "install" in the agreement only meant to place the new machine where the old one had set and plug it in at the old receptacle. The customer held that the word "install" meant to put the machine in ready to run, including any increase in copper needed for satisfactory operation, and hired a lawyer to bring suit to compel the company to put in the heavier wire. The case was finally settled out of court, the company being the loser. Be careful, therefore, in filling in the body of your change-over agreement to cover any such possible cause for disagreement by positively stating, in any case where it seems necessary, just what the company will or will not do as regards wiring changes.

CONVERTERS NOT SATISFACTORY

In the case of medical specialists it sometimes seems as though the cheapest way out for the company would be to buy a rectifier or motor-generator set and leave the apparatus unchanged, but don't do it unless it is absolutely impossible to get similar apparatus for alternating-current operation. Several companies have tried this plan, always with unsatisfactory results, and have finally installed the alternating-current equipment. Almost every kind of machine or appliance can be obtained wound for alternating current.

And another thing—don't buy any apparatus except the best. Remember that the customer will look to you for some time to come to see that the new alternating-current appliances give good service, and that he is naturally a little suspicious of the change and expects that somehow the company is trying to get the best of him in the exchange. So far as is possible, see to it that the new appliances are at least as good as, and preferably better than, the old direct-current equipment ever was.

Naturally, the actual shifting of apparatus and cutting over of services from one current to the other must be conducted with as little inconvenience and loss of working time to the customer as is possible.

Co-operation Needed in Rural Service

Organized Bodies of Farmers and Those Interested in Serving Them Must Solve the Problems Involved in Promoting Use of Electrical Energy in Rural Districts—Entire Subject Worthy of United Study

TWO phases of the rural electric service situation need careful attention now if trouble and confusion are to be avoided in the future. During the past few years the demand for electrical service that has come from the farmer has apparently been founded on sound economic grounds. Judged by the standards of older developed classes of service, the costs of energy have proved high because of its small use and the scattered locations of the consumers. This did not deter the farmer from seeking service until his financial situation forced a modification of his normal activities. Present indications are that the demand is being renewed as the farmer gets back on his feet financially. With the renewed demand inquiries are coming from farm sources concerning the costs of obtaining service facilities and the ensuing rates for electrical energy. The two questions that must be answered are: (1) What maximum use can the farmer make of electrical service, viewing the farm as an industrial establishment? and (2) How can the central-station company furnish its share of the service to the best advantage at a reasonable price?

How Can the Farmer Use Electrical Energy?

To reduce the cost of electrical energy on the farm requires the development of methods for increased use in the home and routine agricultural tasks. The uses in the farm home are probably fairly well developed, since this use is not different from that in the city home. Light is the first use. The washing machine, iron or ironing machine, heating appliances and other familiar items of equipment are as useful on the farm as in the city. The electric range is an important factor because it is the only method by which the farmer can escape the wood or coal range or the oil stove. That it is a practical home device can no longer be questioned. Its application to farm use should be actively studied. The churn, water-pumping equipment, milking machinery and the general utility motor are items of equipment that have been developed to some extent, though it is questionable if the limit has been reached. As an example, the water supply on a stock farm is a most important factor. It is asserted by some farm authorities that if ample water supplies are available at well temperatures during all the months of the year and coupled with proper feeding, the time of preparing stock for market can be materially shortened, resulting in a direct saving of expense. In the winter season in many parts of the country stock will drink only a fraction of the amount of water that should be consumed because of the low temperature of water taken from tanks or reservoirs. With present methods the supply is often irregular and stock suffers accordingly. Electrically driven pumps are susceptible of almost unlimited automatic control. Of what use can such control be in the handling of water supplies?

Much the same problem can be found in the question of using ground feed, and particularly in the mixing of various kinds of grain. It has been said that the grinding of feed on the farm is only an intermittent job at best. With the automatic possibilities of the electric motor it may be that a general-utility motor can be utilized and grain ground in greater quantities and over longer periods of time to give better control of feeding and consequent better results in the marketing of stock. In this connection the present situation in respect to farm machinery is interesting. The machines in use on the average farm are not highly developed from the standpoint of mechanical efficiency. This is not a reflection on the manufacturers of farm equipment. They have built equipment to fit such conditions as existed. That equipment has helped tremendously in promoting efficiency in farm work. However, until the past few years most of the equipment has been designed for either horse or man power. The mechanical efficiency requirement has been that the power needed shall not exceed the capacity of the driving power. In general, with horse-drawn equipment there has been a large surplus of power for emergencies. Mechanical inefficiency has not been revealed as a matter of dollars and cents in fuel costs, and so long as the horse was not overloaded mechanical inefficiency has not been reflected in the cost of his upkeep. With the advent of mechanical power devices the question of mechanical efficiency of equipment becomes an important one, since it has a direct bearing on the cost of operation. If mechanical power of any kind is to continue in use on the farm, it cannot be long until the refinements that have been necessary in other industrial equipment will be found necessary in farm equipment. The tendency is already in evidence in many directions. Along with such a development must come better care of farm equipment, which means less machinery abandoned in the fields to rust until the next season's work begins and still further improved service organizations on the part of the farm equipment people. The farmer, with his experience in the use of the automobile, the gasoline engine and other mechanical equipment, is in better position today to appreciate this than he has ever been before, and under the pressure of economic need the lesson will be more thoroughly learned. With the development of greater mechanical efficiency in farm equipment must come the consideration of electrical energy as an aid in development

How Can the Central Station Supply Electrical Energy?

It seems hardly necessary to review all the past discussion touching the question of how the central station can supply electrical energy. It is becoming increasingly evident that, so far as the central-station lines can reach, the handling of such a supply is a central-station job. Either the central station must bring to the problem its experience and help in finding the answer, or the farmer will be forced to find his own way at the expense of repeating the errors made in the past by central-station men, in the effort to enter what is legally and from a commission regulation view-

point central-station business. This latter course is an illogical and uneconomical one and unworthy of central-station initiative. In the giving of such service from central-station systems there are certain costs involved that are susceptible of analysis. It is true that these cannot be set down at once and with complete confidence that all items have been adequately covered. Movements are now under way in which studies are being made of these costs. In the past two years particularly much progress has been made and there is a much clearer understanding of the problem than there was even a year ago. The studies of these costs must be prosecuted until figures on which practice can be based are made available to every one who cares to know them.

How Can the Problems Be Worked Out?

There are two distinct problems involved. The first covers farm methods and equipment. It cannot be worked out by central-station men. Only men who know the farm and its problems can do it. In the United States today there are more than half a hundred experiment stations devoted to the farmer and his interests. In their hands lie the means of carrying out a large part of the research work that is necessary. Men involved in the work of these stations have expressed themselves informally as eager to undertake such work, going even to the extent of putting competent technical men on electrically equipped farms to carry on investigations as to the ways in which electrical energy can be properly utilized and how more efficient methods and equipment can be developed. There are the manufacturers of farm equipment, most of whom have seen the problem and are engaged actively in the improvement of equipment for use on the farm. There is an agricultural press that has done efficient work in the education of the farmer to better methods of work and living. The farm bureau is another organization that is interested. And not the least of those interested are the men who have undertaken the development of the individual farm plant. Some central-station men have been short-sighted enough to resent the business obtained by these manufacturers. The term short-sighted is used advisedly because it is believed that the individual plant has a very definite part to play in the development of electric service on the farm and that the central station cannot afford to assume other than a friendly attitude toward this development as one of the means of giving the farm the benefits of electrical energy. All of these agencies have something to offer in the solution of the problem. With them will lie the determination of the extent to which the farmer can use electricity.

On the other hand, these agencies cannot work out the problem of the central station and electrical manufacturers. The solution of that problem lies in the hands of central-station men who are trained to think in terms of distribution of energy and efficient service, and in those of electrical manufacturers, who have been called on to face similar problems in the past. That this is so has already been recognized among central-station men in the appointment of the national rural lines committee of the National Electric Light Association, which has made a beginning in its work during the past year. Electrical manufacturers are busy on the problem in many directions. Along with its own peculiar problems the central station, because it is the first point of contact with the individual consumer, must carry a share of the burden of getting the results of the investigation work done by the various interested agencies to the individual farmer. To a greater extent than any other class of men the farmer is an individualist and must be reached individually. This condition may make a slightly more difficult problem than that involved in the early educational work done through central-station men in the industrial field, but the educational work in the farm service field is no different in type from that central-station men were called on to do in the industrial field. The lessons learned there will be of immense value in avoiding pitfalls in the newer line of endeavor.

Co-operation the Answer

There are two ways in which the development can be carried out. One would be to let each side in interest go its own way. Eventually the force of economic pressure would force a solution of the problem at the expense of much labor, controversy and many mistakes. The other would be that of co-operative work. Following this course mistakes would be made and serious disagreement might exist at times. In the end the question as to how the farmer can best use electrical energy in his operations would be answered promptly on a basis which would be thoroughly understood by all concerned, at the saving of much time and expense. The former method would be likely to end in the political arena with profit to none concerned. The latter would avoid such undesirable results. It is not possible to state now how such a co-operative movement could be handled. It might be found desirable to have a joint committee something after the fashion of the committee handling the inductive co-operation problem. Such an organization would act as a steering committee in co-ordinating the efforts of all the forces at work. At best it could handle only a small portion of the forces, but those would probably be the most important and controlling ones. Backing up this sort of work should be a close relation between the various local interests involved. As an example, the Iowa Agricultural College at Ames has already undertaken investigation of some of the phases of the problem in co-operation with the Iowa Section of the National Electric Light Association. This is only a start, but it has already brought into the work the type of men who can be of immense assistance in solving the problem. Every state association and every utility having such a problem ought to be in intimate touch with the agencies representing the farmer in their own localities. In this way real progress can be made and misunderstandings that may end in political mix-ups can be avoided. Back of the problem are facts that need to be set forth as a basis on which every one interested can build. This can be done best through co-operation.

Electrification Plans in Holland

THE Dutch government has just appointed a commission for the purpose of closely studying and eventually improving an electrification plan which was submitted to the government some time ago. It is intended to erect five large central stations, able to take the place of the numerous smaller ones now existing. In connection with this project plans for the electrification of the Dutch railways are under way. The first line to be electrified will be that part of the Dutch Railway running from Amsterdam and The Hague to Rotterdam. All the other leading railway companies, as well as the Dutch State Railways, are at present examining the problem of electrifying their lines.

Letters from Our Readers

A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute

Expedients Should Be Adopted with Caution

To the Editors of the Electrical World:

In an article appearing in the *Electrical World* a short time ago there was an illustration of three 100-kva. transformers connected in a bank and a stream of water was shown being played on one side of the tank of each one of the three transformers. In this way, the author pointed out, the capacity was increased from 300 kva. to 450 kva. It immediately occurred to me that this might very well lead operating companies into trouble and cause excessive internal heating due to the higher current densities and possibility of local hot spots.

Before applying such expedients it would be advisable for plant operators to consult the manufacturers of the equipment to ascertain whether any operating hazard would thus be incurred.

L. F. WOOLSTON,
St. Louis, Mo. General Electric Company.

[We agree with the idea expressed by Mr. Woolston most heartily.—EDITORS.]

Solving the Fuse-Plug Problem

To the Editors of the Electrical World:

I have read with interest the article by W. W. Merrill in the Nov. 4 issue of the *Electrical World* under the heading "Waste and Loss in the Fuse-Plug Situation," and it occurs to me that the way to handle the situation of which Mr. Merrill complains is for the interested manufacturers to combine and run an educational publicity campaign to educate the public to the necessity of always having on hand a supply of fuses.

The small cartons containing enough plugs to meet any ordinary emergency provide a convenient way for the average householder to stock them. I feel that there is a great opportunity to improve conditions by the education of the public, which so far as I am aware has never even been attempted.

ROBERT CHARLES COLE,
The Johns-Pratt Company, Hartford, Conn. Sales Manager Electrical Division.

Improving the Operation of Electric Ranges

To the Editors of the Electrical World:

I have noted with interest the letter in the *Electrical World* of Oct. 28 by George M. Hardy in reference to improving the operation of electric ranges. The writer has been interested in this matter for more than a year and has considered the two methods suggested, but has devised another method which should prove more satisfactory from the various points of view. The objection to using 220-volt elements in the units is that they are not long-lived. They compare with the 220-volt filament lamp as against the 110-volt lamp for ruggedness and durability. The objection to using an auto-transformer is the added cost of installation as well as the reduction in efficiency.

The most practical way which has been devised and tried by the writer is to have a switch for each individual plate or unit which will put the two halves of a unit in series across the 220-volt line for high heat, using the rugged and durable 110-volt element instead of the present method of putting them in multiple across 110 volts or one side of the three-wire line. The same switch would put one-half of the element across 110 volts for medium heat and the whole element in series across 110 volts for low heat as at present. By this method not only is the operating condition improved to the same extent as by the methods mentioned by Mr. Hardy, but the efficiency and speed are also improved.

This switch is now being offered to the manufacturers and will doubtless be accepted as standard, as its cost is very little more than the cost of those now in use.

G. R. BLAKESLEY,
Janesville Electric Company, Janesville, Wis. Commercial Manager.

Interconnection Log Sheets

To the Editors of the Electrical World:

Referring to the editorial in the *Electrical World* of Nov. 4, 1922, on interconnection log sheets, our dispatcher's log sheet covers incoming power at all points hourly. Our substation log sheets cover outgoing power on all feeders hourly. This is, of course, in addition to the special demand-measuring devices. We feel that the first record—that is, of all incoming power—is necessary in order to know the exact system production each hour. Any unusual variation in this figure can be checked by the outgoing meters at the various substations where we are delivering power to large customers who have plants of their own and consequently are apt to vary the amount which they take from us to a considerable degree.

W. R. BELL,
New England Power Company, Worcester, Mass. Operating Engineer.

The International Status of Superpower Systems

To the Editors of the Electrical World:

The writer has read with interest the article entitled "The International Status of Superpower Systems," printed in the *Electrical World* on page 814, Oct. 14, especially the section on high-tension cables. In this section various extra-high-tension cables in Europe are mentioned.

A great real of rather misleading information has appeared in the past on the subject of high-tension cable installations. For instance, articles have been written on a proposed high-tension cable system, which system might never materialize or else was actually operated at a lower pressure. The original article, however, has often been quoted as authority for the actual existence and operation of a "super-cable." In the above-mentioned section on high-tension cables there appear to be several errors or omissions, and in order to avoid perpetuating certain false impressions which might be gained from your article, we desire to make certain comments about some of the cable mentioned, these comments being based on a careful study of foreign high-tension cables both from the technical press and from private sources.

France.—The report mentioned 70,000-volt single-conductor cables and 50,000-volt three-conductor cables. It seems quite probable that the 70,000-volt cable referred to is the cable at Lyons, which has operated for many years on the Thury system of high-voltage direct current at 70 kv., which is of course a considerably different proposition from alternating current. It is understood that 60,000-volt single-conductor cables have

recently been installed in Paris, and a 50,000-volt single-conductor cable line installed some years ago at Chalons-sur-Saone; also that there are several installations of commercial lengths of three-conductor cables for 33,000 volts. Mention was made in 1910 of a short length of 40,000-volt three-conductor cable. If a 50,000-volt three-conductor cable exists, the writer believes that it must be a very short or experimental length.

Sweden-Denmark.—Our information is that the submarine cable connecting Denmark and Sweden is a three-conductor 25,000-volt cable installed in the fall of 1916, rather than a 50,000-volt cable installed in 1913 as mentioned in the report. When first mentioned in the press the cable was called a 30,000-volt cable, but the actual working pressure used was 25,000 volts, as shown by numerous articles in the technical press and confirmed by private sources. It is of course possible that the voltage has been doubled comparatively recently, but this does not seem probable in view of the insulation thicknesses and the fact that no publicity has been given to this change.

Italy.—The report states that in Italy three-phase cables are used at 30,000 volts and single-conductor cables up to 80,000 volts. The figure seems to be correct for three-conductor cables, but our information is that the single-conductor cable for 80,000-volt three-phase operation was never delivered to the customer and that the project has been dropped. There were two 38,000-volt single-conductor installations in Italy, the working pressure of one of which was reduced to 22,000 volts a few years ago, the present status being unknown.

England.—The article seems to be correct in stating that the upper limit of voltage is about 33,000 volts, the cables being in three-conductor form.

Holland.—The report states that Holland uses cables up to 50,000 volts. A Dutch commission was formed to study the question of a suitable voltage for the country and has recently made a series of most excellent reports on the subject, 50,000 volts being recommended as the most suitable pressure. Two different lines of 50,000-volt underground cables were planned to connect to overhead lines of the same voltage, one line being three-conductor and the other single-conductor in form. We have been informed that the former developed considerable difficulties, and until recently was not in operation, while the latter has been operating at 10,000 volts pending the arrival of station apparatus.

Switzerland.—A 150-mile line of 30,000-volt single-conductor cable is mentioned. This statement is believed to be closely correct but somewhat misleading, since the line, which is undoubtedly the St. Gothard line of the Swiss Federal Railways, consists of four single-conductor cables, and apparently the 150 miles is the total cable length instead of the length of line. The cables are single-conductor cables for operation at 60,000 volts single-phase with the midpoint grounded, so that each cable has to withstand 30,000 volts only. However, the other single-conductor cables have been rated in terms of line pressure rather than of voltage between conductor and sheath, the previous cables all being for operation at the stated voltage three-phase, and it seems only fair that the Swiss cables should be called 60,000-volt cables, though the voltage per cable on this single-phase line is 30,000 volts, as compared with about 35,000 volts per cable on the Paris 60,000-volt three-phase line.

It is, of course, most difficult to obtain exactly correct information about all the foreign high-voltage cables since reports are sometimes conflicting. However, we feel sure that the figures given above are very close to the true values, since converging evidence has been obtained from various sources in all cases. Additional information in regard to three-conductor cables at least is offered in the Oct. 5, 1922, number of *Elettrotecnica*, which has just been received. On page 667 appears an article by Sacchetto, of Pirelli & Company, the well-known Italian cable makers, in which a positive statement is made as follows: "At the present time there are no three-conductor cables in service at voltages above 33,000 volts." The main purpose of this letter is to avoid the inference which naturally would be made from the article that various systems are in commercial use or are even standard practice, whereas, in actual fact, many of these are probably only experimental, projected, or even abandoned. DONALD M. SIMONS.

Standard Underground Cable Company,
Pittsburgh, Pa.

[The report published was an abstract of the translations of the papers presented at the congress.—EDITORS.]

An Opportunity for Exchange of Experience

To the Editors of the Electrical World:

As a small plant usually has only one man to furnish the brains for all the different classes of work carried on, this one man is often called upon to tackle work in which he has had no previous experience. Usually books cover only the theory of different operations and give nothing concerning actual methods used to accomplish results. Therefore detailed experience on the following subjects would be of interest to the writer and doubtless to many other power-plant managers in a similar position:

Methods of testing, adjusting and repairing switchboard instruments in detail.

Methods in which a meter manufactured for one number of phases or one voltage may be made to operate on a different number of phases or voltage, including detailed diagram of connections.

Proper methods of installing motors, generators, engines or cables, showing details of leveling and lining up.

Methods of locating faults and making repairs to the above apparatus, using simple instruments.

Proper and improper transformer connections, with reasons why some which appear good are not generally used.

Installation operation troubles and proper remedies for small water-power plants.

Buying, selling, handling customers and handling labor. CLARENCE N. BRIDGE,

Electric Light & Water Works, Superintendent.
Charlevoix, Mich.

[Any practices or experiences on the above subjects which are contributed by the readers of the *Electrical World* and which would be of interest to the majority of its readers will be gladly published.—EDITORS.]

A Correction

In the letter entitled "The Fused Neutral," by L. H. B. Sandwell, in the issue of Nov. 18, an editorial error was made with respect to the directions of the arrows on the diagram. The cut on the right should have had all the arrows on the right-hand side of the branch circuit pointing to the right instead of to the left. The cut on the left has an arrow in the top middle wire reversed.

Industrial and Station Practice

Installation, Operation, Test and Repair of
Generating and Distribution Equipment and Methods of Economically Utilizing
Electrical Energy in Mills and Factories

Individual Responsibility in Plant Inspection

SUCCESS in central-station operation depends in large measure upon faithful and intelligent inspection. In some quarters it is believed that this inspection cannot be rendered without elaborate records and forms, comprehensive books of instruction and a system of checks and balances that at least purports to show minutely at all times the inspection history of all station apparatus. In response to an inquiry by the editors of the *Electrical World* as to the inspection methods followed by the United Electric Light Company of Springfield, Mass., in relation to steam and hydraulic generating machinery and auxiliaries, the writer gives it as his firm opinion that men are far more important than too minute records in handling this class of work.

ALLOCATION OF INSPECTION

All of this company's electrical maintenance work, electrical inspection and new construction of an electrical nature in generating and substations is in charge of the company's electrical engineer, and the thorough inspection system employed on the electrical side of the property has been described in the *Electrical World* in an article published Nov. 6, 1920, on page 923. On the so-called steam and water ends the superintendent of the generating department has charge of the operation of all equipment, including electrical apparatus in stations, also supervision of all steam-plant maintenance, waterwheel inspection, repair work on boilers, piping, governors, buildings, etc. This division of plant work results in well-defined responsibilities, co-ordinates the operation of prime movers, auxiliaries and electrical equipment and insures thoroughness in maintenance.

On the steam side of the station the stokers and coal-handling machinery are under practically continuous inspection, and constant watchfulness is also given to operating turbines. One man is maintained on duty constantly in the space above the boiler coal bunkers to attend to lubrication of conveyor equipment and see to it that the fuel supply is at all times running smoothly. Particular attention is paid to all bearings concerned in the fuel supply, and no chances are taken of the piling up of coal in the wrong place through improper operation of conveyors, etc. Turbines are closely watched for vibration, and the larger units are shut down at least weekly for inspection. At such times the automatic stops are tested and lubricating oil is drained and filtered, including that serving auxiliaries.

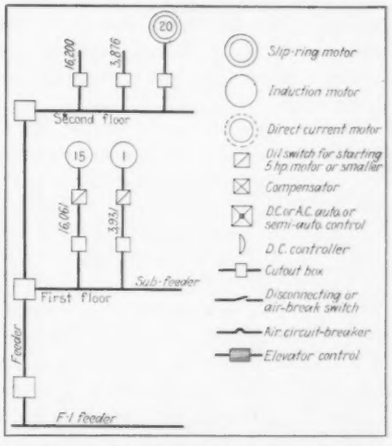
Boilers are thoroughly cleaned yearly both internally and externally and all fusible plugs renewed. At this time the boilers are inspected by a state or insurance inspector. In addition, all boilers that are in 24-hour service are taken out of service every four weeks and the first two rows, or more, of tubes are bored if conditions warrant. The brickwork is inspected, stoker equipment looked over thoroughly and combustion chamber cleaned at such times. This inspection period may appear short as to intervals between examinations, but it has resulted in practically 100 per cent service from all boilers during hours of operation, and I recall no instance where a boiler has been withdrawn from the line when needed for service. Fans for stoker air supply are inspected fortnightly and are thoroughly cleaned to prevent unbalancing and excessive wear of bearings. Air washers are inspected weekly and elevators at the same interval, a signed report of the latter being turned in. A complete overhauling of the turbo-generating units occurs yearly.

The operating staff in charge of steam and hydraulic equipment is from the nature of the work constantly inspecting such equipment. Waterwheels are inspected semi-annually at least, alignment of bearings receiving particular attention. In the absence of extended records of the routine gone through with in equipment inspection a list is posted in the turbine room at the State Street station showing exactly what units of apparatus on the steam side of the station are assigned to particular individuals for inspection responsibility. It is not believed necessary in the maintenance of such equipment to resort to elaborate forms recording minute details of inspection. The staff is composed of trained and responsible men to whom the company looks for results rather than methods, and considerable latitude in the ways of accomplishing the required service is freely permitted. The company does not lack records of its steam and hydraulic equipment troubles, but we have kept away from any temptation to maintain elaborate clerical reports of inspection, and the policy seems justified.

W. D. PACKARD,
Superintendent Generating Department.
United Electric Light Company,
Springfield, Mass.

Symbolizing Industrial Motor Layouts

A DIAGRAMMATIC method of recording motor layouts shown in the accompanying illustration is



CONVENIENT SYMBOLS FOR INDUSTRIAL PLANT WIRING AND MOTOR LAYOUTS

used at the plant of the Fisk Rubber Company, Chicopee Falls, Mass., as illustrated. The diagram virtually represents an elevation of the

wiring, the feeder and junction-box arrangements at different floor levels being indicated symbolically as shown, and sub-feeders, taps and motors, with compensators and other information, are readily included. Motor ratings in horse power are indicated by figures in circles, and the number of any leased machine is indicated on the appropriate tap circuit. Quick understanding of the electrical layout is greatly facilitated by these schematic diagrams.

P. L. BUTTERFIELD,
Chief Electrician.
Fisk Rubber Company,
Chicopee Falls, Mass.

Cable in Flexible Tubing Allows for Expansion

THE protection of splices and compensating for expansion and contraction in a 2,800-ft. lead-covered cable laid on the Interstate Bridge spanning the Columbia River at Vancouver, Wash., were ingeniously provided for by the engineers of the Portland (Ore.) Railway, Light & Power Company. The cable was installed in a 3½-in. conduit laid on the curbing as shown in Fig. 1. Owing to the 2,800-ft. run several splices were necessary. Where cables are installed in conduit splices are usually protected by steel cabinets, which are not only unsightly but expensive. The method of housing the splices shown in detail in the upper half of Fig. 1 made a job of neat appearance and provided a maximum of protection at a minimum of expense. The bushing, the reducer and a 4½-in. sleeve cost about $16 a splice. The labor of installing was approximately a dollar per splice, as against about $10 had a steel cabinet been used.

Some method of allowing for a total expansion and contraction of 2½ in. at the expansion joints in the bridge had to be devised. This was accomplished as shown in Fig. 2. The cable was passed through a 3-in. metal carburetor hose formed into a loop and the end of the hose sweated into brass collars. These collars form a bell mouth and bind the end of the flexible tubing inside the end of the conduit, as shown in cross-section in Fig. 2. One end of the conduit was offset to allow the loop in the cable to be easily made. The cable was pulled both ways through the expansion joint. In one direction it was pulled directly off the reel. A sufficient length for the pull in the other direction was then taken off the reel and cut. Before making this last pull the carburetor hose was slipped over the end of the cable. The total material cost was approximately $21, and the labor cost about $1.50 per expansion joint. A steel cabinet 10 ft. x 4 ft. x 2 ft., costing approximately $50, would have been required for each joint had the obvious method of providing for expansion and contraction in the cable been employed. Furthermore, where the cable is in view of the public as in this case, the use of the flexible metal tubing made a much more sightly installation.

R. S. CARROLL,
Superintendent Underground Distribution.
Portland Railway, Light & Power Company,
Portland, Ore.

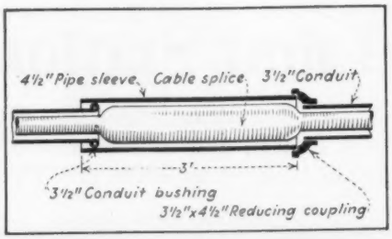


FIG. 1 — PROTECTION OF SPLICES IN LEAD CABLE ON STEEL BRIDGE IMPORTANT

Above — Splice protected by conduit sleeve. Below—Easily and cheaply constructed splice housing eliminates use of costly steel cabinet.

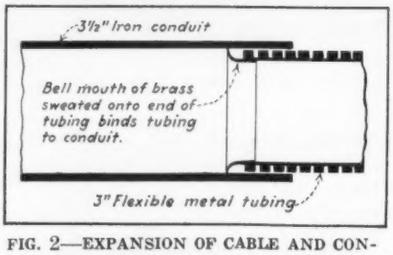


FIG. 2—EXPANSION OF CABLE AND CONDUIT TAKEN CARE OF BY LOOP

Above—Flexible steel tube provides mechanical protection at expansion joint. Below—Longitudinal section showing method of fastening flexible hose in end of rigid conduit.

Boiler-Room Experiences of Three Plants

RECOMMENDATIONS covering boiler-room control taken from actual operating experience in three steam plants were given recently by the sub-committee on boiler-room operation of the Empire State Gas and Electric Association at its annual convention at Lake Placid, N. Y. A. C. Jordan of the Elmira Water, Light & Railroad Company was chairman of this committee. The experiences were contributed by the Elmira (N. Y.) Water, Light & Railroad Company, the Rochester (N. Y.) Gas & Electric Corporation, and the Buffalo (N. Y.) General Electric Company.

Every boiler room should be equipped with one large steam gage, reading approximately 15 lb. per square inch each way of the ordinary operating steam pressure. This gage should be equipped with an illuminated dial with approximately 1 in. on the scale to 1 lb. pressure. The ordinary steam gages furnished with boilers are difficult to read and do not have fine enough scale markings. They require too much of a change in pressure to indicate. Such a steam gage has practically eliminated low steam pressure in these three plants.

Balance draft should be maintained either by hand or by automatic control, preferably by automatic control, as then one does not have to depend on the firemen to maintain the draft at all times, and there are certain times in the fire room when the human element comes short. Pressure in the furnace should be maintained as near zero as possible.

Boilers should be equipped with automatic feed-water regulators, preferably of the type that drops the water level slightly with increase of

load. Each boiler should be equipped with a steam-flow meter with both recording and integrating mechanisms, since this very materially assists in load dispatching.

One of the most valuable accessories in the boiler room is a boiler meter. By this is meant a meter which indicates at all times the drop in pressure through the passes of the boiler or through the fuel bed, because once this instrument is properly installed, one can burn coal much more efficiently than with any other device known to the committee.

In at least one of these plants a stoker revolution counter has been found invaluable, owing to the fact that in burning one grade of coal of uniform quality it has been possible to insist that the firemen keep the speed of the stokers within very narrow limits. It also gives a valuable check on coal weights, because from a period of tests it is possible to arrive at the average amount of coal per retort per revolution of the stoker.

Mechanical control of air and coal fed to the boiler has been tried in some places, but the committee is not at present in a position to make a report on its advisability.

The above details cover most of the mechanical features of boiler control. There are other things that are as important in boiler control as the mechanical features, or even more so. These are load dispatching and the personnel of the fireroom. With boilers equipped for such operation, load should be dispatched so that they will carry from 150 per cent to 225 per cent of rating when they are on the load. Various indicating and recording thermometers should be used to check operation in the fireroom. A competent foreman in charge of each fire shift and a thorough education of new men who are broken in as firemen will tend largely to the increase of efficiency in the boiler room.

FIELD EDITOR ELECTRICAL WORLD.
New York, N. Y.

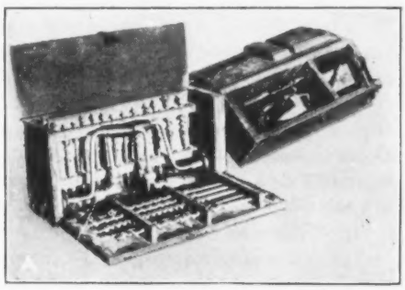
Saving Time in Handling Tool Equipment

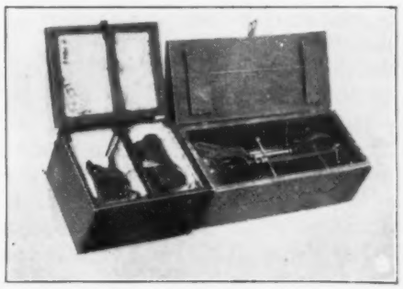
THE difficulty of keeping and caring for tools in power company service work is well recognized. There is always a danger of tools or parts of tools being overlooked and forgotten when men are left in isolated places for a time to do a special job. This not only entails the expense of replacing the tools, but lessens the efficiency of the service wagon, the loss not being noticed until the tool is urgently needed for other work. Very little that is lost in this way is ever recovered.

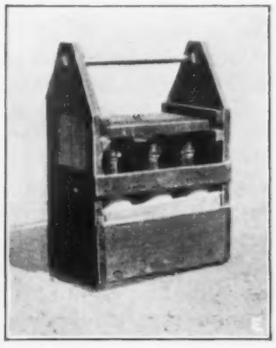
Three years' experience in the field has led to the development of boxing equipment for use on service wagons of the Pacific Gas & Electric Company which not only saves time but prevents loss and facilitates in every way the handling of tools and equipment. Each box is arranged to care for groups of tools generally used together, so that one box will usually cover the needs of a small job and can be left with one piece of work while other equipment is being transported elsewhere. Boxes were made one at a time, and each one was designed to meet its particular need. They are light enough to be easily portable and suitable for transportation by express or car as occasion may demand.

Among the boxes which have been worked out for particular equipment are the bit box, containing wood bits with braces and expansion bit; also a smaller box containing drills from ½ in. down, the hand grinder and a hand drill for working small drills by hand. An electric drill is used for larger sizes. For the ammeter with its current transformer a canvas-lined box is used, stuffed with excelsior, and there is a special box containing pipe-threading tools for cutting threads on ¼-in. to 2-in. iron pipe and conduit. This box also includes the pipe vise with bolts, pipe cutter, reamer, oil can and waste. In the oil sample or shipping-case the removable reversible cover is made in two halves and is held together by a meter seal or wire, being made so that it cannot open while this wire is in place. On one side of the cover is the forwarding address and on the other the return address.

A special box cares for the set for testing the oil in the field. When the case is opened out flat the parts are







SUITABLE BOXES FOR EQUIPMENT PREVENT LOSS AND FACILITATE HANDLING OF TOOLS

Each box is arranged to care for groups of tools generally used together. They are light enough to be easily portable by express or by an automobile such as is shown in D. A bit box containing wood bits with braces and a smaller box for drills from ½ in. down are illustrated in A. A canvas lined ammeter box and pipe threading equipment is shown in B, while C is an oil test set for making tests in the field. A case for carrying oil samples equipped with reversible cover is shown in E.

connected together and in position for work by placing the gap cup in position and attaching it to the power source. This case also contains two quart measures, a drip pan, rags for wiping up the drip, a special drawing spout made from a short piece of ⅛-in. pipe and a complete set of reducing bushings from 2½ in. to ½ in. to fit all valves.

These cases fit neatly into the usual service car or can be carried individually or sent by express. With good tools properly cared for and kept in their proper places, a foundation is laid for better work and loss, wear and replacements are minimized.

F. F. LODER,
Foreman Substation and Maintenance.
Pacific Gas & Electric Company,
Corning, Cal.

Remote Control by Radio Possible

Description of a Relay Developed by the Bureau of Standards—Simplicity and Ruggedness Important Features—Delicate Adjustments and Light Spring Contacts Avoided

THE possibility of remote control of apparatus by radio has excited a great deal of comment among central-station engineers, particularly since the work of the navy in which war vessels have been so controlled and a number of civilian experiments in which automobiles and smaller vehicles have been so handled were announced in the news columns of the daily press. The Bureau of Standards has developed a relay* by means of which radio signals can be received and recorded or used to operate a remote-control mechanism. As an example it would be possible to send and receive a predetermined set of complicated signals arranged to operate a selective mechanism built on something of the same scheme as the automatic telephone selective devices in common use. The signals might be so arranged that accidental reproduction by an outside agency would be a virtual impossibility. The necessary devices to utilize the relay for remote-control purposes have not been developed, but the possibilities involved are apparently great enough to justify serious study on the part of central-station engineers.

The diagram of connections for the relay recorder for use with batteries is shown at the left of Fig. 1, while the principle of operation is illustrated at the right. Variations of the grid potential produced by the incoming signals cause a pulsating direct current in the plate circuit, which flowing through the condenser across the relay winding causes an increase in the plate current at the keying frequency. This change in current closes the relay contacts, thereby controlling any mechanism desired.

During the development of this relay it was found that the rectified audio-frequency current in the plate circuit caused the relay armature to chatter rapidly and make a poor contact with the fixed contact point through which the circuit is closed. This was overcome completely, however, by the addition of a 1-mfd. condenser across the relay coils. This serves the purpose of an audio-frequency bypath for the highly inductive winding of the relay, thus greatly decreasing the resistance of the circuit. The change of plate current due to this audio-frequency causes a second change which occurs at the keying frequency. This latter change passes readily through the relay coils and exerts a steady pull on the relay armature.

It was also found that the 0.0006-mfd. variable condenser (Fig. 1) across the secondary of the input audio transformer made possible audio tuning, which increased the selectivity considerably. By means of this tuning it was found that European stations could be made to operate the relay while a high-power station here in the United States would fail to operate it, although the high-power station was coming in on approximately the same wave length and slightly stronger. This was made possible by adjusting the heterodyne note of the European station to a frequency different from that of the local station and then tuning the secondary of the audio transformer to that frequency. The 0.0006-mfd. variable condenser may be replaced by a 0.0003-mfd. fixed condenser and the audio tuning accomplished by adjusting the heterodyne note to the resonant frequency. By means of this audio tuning one of three stations transmitting simultaneously has been selected and caused to operate the relay.

By using two relay recorders connected in series across the output terminals of a single radio receiving set two messages sent on practically the same wave length, but of different audio frequencies, have been accurately received simultaneously.

Tests showed that with a signal

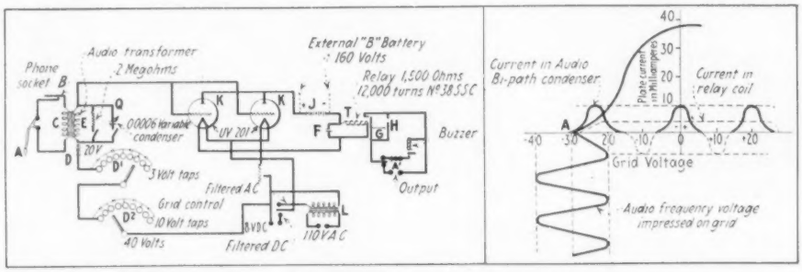


FIG. 1—RELAY RECORDER CONNECTIONS FOR USE WITH BATTERIES AND TUBE CHARACTERISTICS SHOWING PRINCIPLE OF OPERATION

In the wiring diagram at the left *A* is a telephone plug for connecting the relay device to the amplifier output. *B* is a telephone socket to permit operator to listen to the received signal. *C* is an audio transformer of the type used in audio amplifiers, the type used at present being a Signal Corps type C-21. *E* is a 2-megohm grid leak. *Q* is a 0.0006-mfd. variable condenser or a 0.0003-mfd. fixed condenser. *D* is a 20-volt "C" battery connected in series with D^1 a "C" battery variable in steps of approximately 3 volts, and D^2, which is variable in steps of 10 volts. *J* is a 160-volt dry "B" battery. *K* is a type UV-201 radiatron. *F* and *H* are 1-mfd. paper condensers. *A'* is the output to be connected to the apparatus to be controlled. *L* is a step-down transformer for operating the tube filaments from 110-volt alternating-current supply when such is available.

The principle of operation is illustrated at the right. By means of the variable "C" battery the grid voltage is adjusted to approximately 30 volts, at which value the plate current is zero, as shown at *A*. The incoming audio-frequency voltage impressed on the grid varies the grid potential, for example, between the values of —20 and —40 volts. The 10 volts decrease from —30 to —20 causes an increase, for example, from zero to 10 milliamperes, while the increase from —30 to —40 volts is not effective in causing a plate current to flow owing to the fact that —30 volts is already sufficient to reduce the plate current to zero. The result will be a pulsating direct current of 10 milliamperes, maximum amplitude, in the plate circuit. This current, flowing through the plate circuit and condenser *F*, causes an increase in the plate current at the keying frequency. This change, passing through the relay coil, will pull the relay armature over, making contact at *T*, which contact may control any mechanism desired. With the "C" battery grid voltage adjusted for maximum sensitivity it was found that static induction, etc., operated the relay. When these disturbances are not so strong as the signal their effect on the relay may be overcome. For example, if the "C" battery is increased to —35 volts, the critical value for maximum sensitivity being —30 volts, the disturbances due to strays, induction, etc., merely reduce the "C" battery voltage to —30, which is not sufficient to cause plate current to flow. However, the signal, being of greater intensity than the induction, reduces the voltage to —25, which causes a plate current of 5 milliamperes. It will be seen, therefore, that no disturbing effects, if of less intensity than the signal, affect the relay.

*A complete description of this device was published as "A Relay Recorder for Remote Control by Radio," by F. W. Dunmore, *Journal A. I. E. E.*, April, 1922.

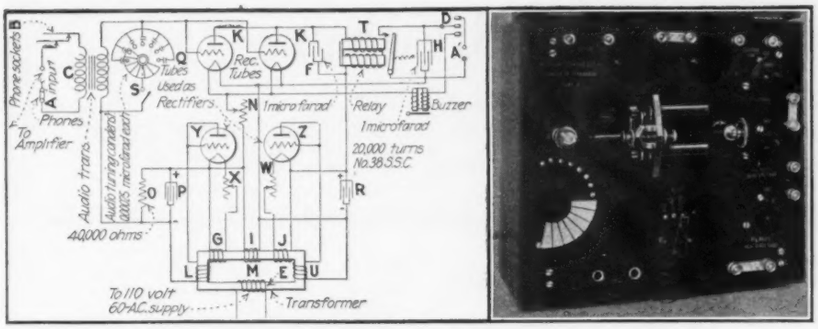


FIG. 2—RECORDER FOR 110-VOLT ALTERNATING-CURRENT SUPPLY

The method of operating the recorder from the alternating-current supply consists in the use of two receiving tubes as rectifiers. The tubes *Y* and *Z* are used as half-wave rectifiers, one supplying the plate voltage, and the other the grid voltage, thus eliminating the "B" and "C" batteries. When used as rectifiers, receiving tubes should have the grids and plates electrically connected together. A special transformer *M* with six windings is used. The windings *G* and *J* supply the filaments of the two rectifier tubes, *I* the filaments of the recorder tubes, *U* the high voltage for the plate; *L* supplies the grid voltage, and *E* is the 110-volt primary winding. The rectified alternating current is smoothed out by means of 4-mfd. condensers *P* and *R*, connected across the output terminals. As the currents in the grid and plate circuits are small, smoothing out inductance was unnecessary. It was found necessary to put 40,000 ohms *O* across the output circuit of the rectifier tube supplying the voltage to the grid, as the grid is otherwise insulated from the filament of tubes *K* by the rectifier tube. By means of the filament rheostats *X* and *W* the grid and plate voltages may be varied over any ranges desirable for the most efficient operation of the recorder. By the use of binding posts with straps (as shown at the right), the type *B* recorder may be operated from *A*, *B* and *C* batteries for supplying the filament, plate and grid voltages respectively in cases where alternating-current supply is not available.

strength sufficient to reproduce a plate current of 10 milliamperes the relay could be operated at a speed of forty-eight contacts per second, the contact being sufficient to operate a buzzer. With 3 milliamperes in the plate circuit a speed of twenty-seven contacts per second was obtained, and with 1 milliampere a speed of nineteen per second. In each case the relay armature spring tension was adjusted for the best operation.

Among the uses to which this apparatus may be applied are: (1) As an ordinary receiver. Here it has advantages over reception with telephone receivers, for one may receive by buzzer or sounder with all induction and interfering noises eliminated, if they are not louder than the signal. (2) A tape or drum-type recorder may be used and a copy made without a trained radio operator. (3) Time signals may be recorded. (4) A call system may be worked by a time switch connected to close the filament circuit for a given time at set calling intervals. (5) Any form of mechanism may be operated by an incoming signal. (6) A receiving station may be located remotely from the transmitting station and the radio signals relayed by wire to the operating room some miles distant. Seven page printers may be operated by radio, the received message appearing in typewritten form as on a typewriter.

For use on a 60-cycle, 110-volt supply the recorder is similar in construction to the one described above except that the plate and grid voltages (B and C battery) are supplied from the alternating-current source. As shown in Fig. 2, the current for operating the tube filaments is also obtained from this source so that the recorder is entirely independent of any form of batteries. It is only necessary, therefore, to connect to the 110-volt alternating-current line and the recorder is ready to operate.

In cases where very high-speed operation is desired the ordinary relay may be replaced by one that has been designed for high-speed operation.

F. W. DUNMORE,
Associate Physicist
Radio Laboratory, Bureau of Standards,
Washington, D. C.

Park Cable Simplifies Street Lighting

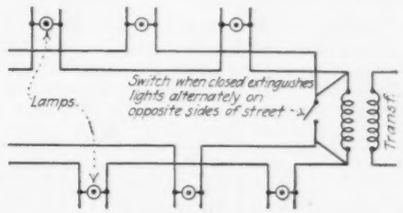
THE use of park cable for ornamental street lighting is now becoming such a frequent practice that some of the details of installation which have been developed may be of interest. In a good many instances it is desirable for reasons of economy to extinguish alternate lights on opposite sides of the street after a certain late hour in the evening. This is accomplished by using two two-conductor park cables and connecting them to the transformer through a switch, as shown in the accompanying illustration.

When it is necessary to connect the park cable to an open-wire series lighting line, the transformer would have a one-to-one ratio with one side connected in series with the open wire. This transformer serves to insulate the park cable circuit from the main line, and its capacity limits the voltage rise in the branch in case the tub transformer supplying the main circuit should send up the voltage because of a break.

Even if the operating voltage of the cable circuit is only 1,500, the latter would be insulated for 5,000 volts to provide a margin of safety on account of the possible action of the tub transformer. Where a circuit is to be supplied from a 2,300-volt commercial circuit, it is connected through a voltage regulator which is nothing more than a small outdoor tub transformer. The voltage for which the park cable should be insulated is then the open-circuit voltage of the regulator.

Single-conductor park cable is, of course, used where it is not necessary to extinguish alternate lights, but in such cases a separate cable is usually provided for each side of the street partly to avoid zigzagging from one side to the other and partly to obviate the possibility of total darkness in case of cable failure in any part of the system.

In some instances where single-conductor cable is used important economies have been effected by eliminating splices at the base of the lighting posts. This is accomplished by stripping the steel-tape armor off the cable and running it as a plain lead-covered cable up the inside of the lighting post from each direction. Thus there are two cables inside the post. The extra cost of using park cable instead of ordinary lead-covered cable is more than offset by the economy of eliminating not only the three-way splices otherwise necessary, but also the large excavation at the base of each post



PARK CABLE ENABLES THE EXTINGUISHING OF ALTERNATE LIGHTS AFTER A CERTAIN HOUR

for a man to work in while making the joints. The net saving that was effected in one specific instance amounted to $2 per post.

F. A. WESTBROOK,
Field Engineer.
Habirshaw Electric Cable Company, Inc.,
New York, N. Y.

Central Station Business

Advertising, Selling and Service Methods
Commercial Organization and Management, Customer and Trade Relations, Public and Financial Policies, and Reports of Company Plans and Experiences

Central-Station Sales Policy and Methods

Outline of Standard Practice for Employees in New-Business Department—How to Receive Customers and How to Handle Complaints

WITH a view to standardizing and tying together the work of its sales department, the Public Service Electric Company of Newark, N. J., has issued a code of instructions for the exclusive use of employees in the new-business department. The company serves a widely diversified territory through several division offices, and this code was drawn up to define the company's sales policy and make for team work in the department. It sets up a high commercial standard, outlining the company's sales policy and methods as follows:

Keep in mind that the sales policy of the company is to sell only goods of the best quality, made by reliable manufacturers, and their guarantees, as well as that of the company, are an assurance to our customers of the most satisfactory service.

Sales Value of a Good Appearance.—All salespeople should remember that their appearance has much to do with the impression that they make upon the customers whom they are trying to influence and that the appearance of the salespeople as a whole affects the impression that a customer receives regarding the company. The impressions received have a direct effect upon the sales made and the commissions earned by the salespeople. Therefore all salespeople should dress neatly and in a businesslike manner. They should avoid extreme styles or conspicuous clothing and a display of jewelry.

Treat a Customer as You Would Treat a Guest in Your Home.—We all like best the people who are courteous and pleasant in their manner toward us, and we are most likely to ask for the salesperson who has previously sold us goods with a marked degree of courtesy and sympathetic willingness to help us obtain the type and quality of goods which best fulfill our needs.

The impression which you make upon a customer during the few moments' interview remains in the customer's mind for a long time and has a marked influence upon his or her future calls. If you have been sympathetic, courteous and polite and really tried to serve the customer, the impression received will be favorable and the customer will be inclined to call again and will want *you* to wait upon her. On the contrary, if you have been indifferent or discourteous, the impression will be unfavorable and the customer will not feel inclined to return.

You will find your efforts most successful if you will always treat a customer with the same kindliness and consideration with which you would treat a respected guest in your home, and you should always try to convey to the customer by your manner that to satisfactorily serve her is the most important matter on your mind at that time.

Most salespeople find it easy to be courteous and polite to well-dressed, well-bred people whose pleasant manner inspires courtesy, but it is not so easy for these same salespeople to be courteous and polite to the poorly dressed foreigner who speaks in broken English and who does not grasp readily what the salespeople mean. You should make a particular effort to be courteous and helpful to foreigners, because our methods and customs are new to them and they may not clearly understand our language.

Voice and Language Have the Power to Sway People.—Keep always in mind that salesmanship is largely the influence of one personality over another. It is very important that the impressions given by your personality be as favorable as possible. Perhaps no single quality of your personality has more effect upon others than your language.

You will find that you will have a stronger influence over people if you use the best language at your command and speak in a well-modulated voice and with an easy, positive manner. You should carefully avoid the use of words with which your customer may not be familiar. It is always well to remember that the most popular speakers use simple language that a child can understand.

Perhaps we are so accustomed to technical terms that we forget the customers may not understand them. So, for instance, when talking to a customer about type C-4 "Mazda" lamps, refer to them as "daylight lamps."

While you may be assigned to the sale of a particular class of goods, you should as rapidly as possible acquire a selling knowledge of all the goods carried in stock. If a customer asks to be shown a certain article about which you are not informed, you should not attempt to answer the question, but should ask the merchandise assistant or the agent to assist you or assign some one else to wait upon the customer.

You will increase the number of customers who will come in and ask for you, and you will make more money in commissions, if you follow the practice of mailing to the customer a week or two after you have sold an appliance a follow-up card provided for that purpose, and inquire if the appliance is giving entire satisfaction. The customer will then feel that your interest did not end when the sale was consummated and will be likely to call for you when additional appliances are needed.

Floor salespeople who are unable to close a sale should try to obtain the name and address of the inquirer and refer it to the merchandise assistant or the agent, who will have an outside representative call.

Avoid Mistakes on Sales Checks and Save Yourself Trouble.—After the sale has been made, thoughtfulness and care must be exercised in issuing the sales checks and completing the transaction. It is important that all writing on sales checks should be plain and distinct so that mistakes in reading will be avoided. All salespeople should be very careful to see that the name and address of the customer is correctly printed. Never use the customer's initials if it is possible to get the full name.

In selling goods to customers living in a territory served by one of our other offices, you should take the order, if it is a cash sale, in the same manner as though the customer lived in the district, and you should collect the money and turn it in just as you would ordinarily. The order should then be telephoned to the district in which the customer lives.

Promises of Delivery.—Goods should be delivered as soon as possible, but you should be careful in making a promise regarding the time of delivery. When customers insist upon goods being delivered at a certain time, you should ask the merchandise assistant or agent, and neither of these should promise delivery at such a time without first ascertaining that the promise can be fulfilled. If the promise is made, it must be fulfilled.

Promises in General.—We cannot emphasize too strongly that you should not make promises which you are not absolutely sure can be fulfilled. If a customer insists upon a definite agreement, you must not allow that fact to lead you into agreeing to do something which cannot be done. It is far better to lose a sale than to secure it on the basis of a promise which cannot be fulfilled.

Misrepresentation. — Misrepresentation to a customer is always a serious matter whether it be done intentionally or unintentionally. You will save yourself and others very embarrassing unpleasantness and you will help maintain the company's reputation for fair dealing if you will so completely inform yourself regarding the goods you

are selling and the conditions surrounding the sale that unintentional misrepresentation will be unlikely to occur.

You should guard yourself against making statements which may be misleading or may be construed to mean something which you do not intend.

What Our Guarantee Means.—Before any type or make of electric apparatus in shown in our salesroom a sample is first tested in our laboratory to determine its safety, efficiency and durability. If the sample does not pass the test, none of that particular make and type of appliance is offered for sale. Every appliance shown and offered for sale is guaranteed to be as represented and to do the work for which it was designed.

All merchandise that proves defective in material or workmanship within one year from date of purchase will be replaced, free of charge, or the amount paid for the article will be refunded.

Receiving Complaints from Customers.—Remember, you must be courteous and polite. The customer making the complaint may be provoked and rather severe in criticising the company's methods. Perhaps some unusual condition has given the customer a just cause for complaint and for being provoked. But. no matter how disagreeable the customer may be, it is your duty to yourself, the customer and the company to keep your temper and be courteous and polite.

First get the facts. Do not guess or assume, but find out the facts by investigating. The actual facts underlying the complaint will show the proper way of adjusting the complaint.

If the facts show the company to be at fault, correct it at once and endeavor to show the customer that the fault was not due to any lack of desire on the part of the company or any employee to give satisfactory service.

If the customer is at fault, try pleasantly and tactfully to show him wherein he misunderstands the matter and then do everything you can to adjust it to his satisfaction.

The company spends a good deal of money to improve its service to its customers, and we believe that most of our employees do their work to the best of their ability. Therefore you will do the company and your fellow-employees an injustice if you criticise either the company or another employee when adjusting a complaint.

The Goal to Work For.—To induce a large number of buyers to come to a store repeatedly for their supplies and to build a favorable reputation and prestige for the store is a hard, complex task. It requires constantly the rendering of a sales service that is so satisfactory to customers that they will come again and make more purchases.

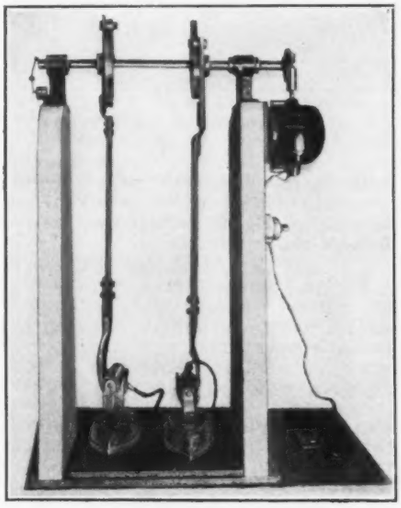
To maintain a satisfactory sales service the goods must be of the newest design and of the best quality for the money. The salespeople must know all about the goods they sell and must help—not force—customers to select the goods best suited to their needs. The salespeople must always be courteous, no matter how disagreeable customers may be, and everything about the store must express cheerfulness, alertness and progressive methods.

If we are to maintain our position as the largest distributors of electric appliances, we must render our customers such a sales service.

Tests of Electric Flatirons

Standard Methods Employed by the Electric Testing Laboratories to Determine Uniformity, Energy Consumption, Efficiency, Durability and Strength of Insulation

RESULTS of a series of very complete tests of electric flatirons have just been issued by R. S. Hale, chairman of the standardizing and testing division of the National Electric Light Association. The tests were conducted by the Electrical Testing Laboratories in New York and are of particular interest as they establish standard methods for testing these appliances. Although the



APPARATUS FOR BUMP TESTS

names of the manufacturers will not be published the results show what kind of performance may fairly be expected from flatirons of several well-known makes.

Five brands were selected as representative of the irons being sold at the present time. All were 6-lb. irons of domestic manufacture. Six irons of each brand were purchased in the open market, and in no case was the dealer advised that the iron was to be used for other than domestic purposes. The schedule of tests was as follows:

I. *General, Weights, Dimension, Etc.*—With the exception of areas and weights of component parts, the observations were made on all irons. These special tests were made on one iron of each brand.

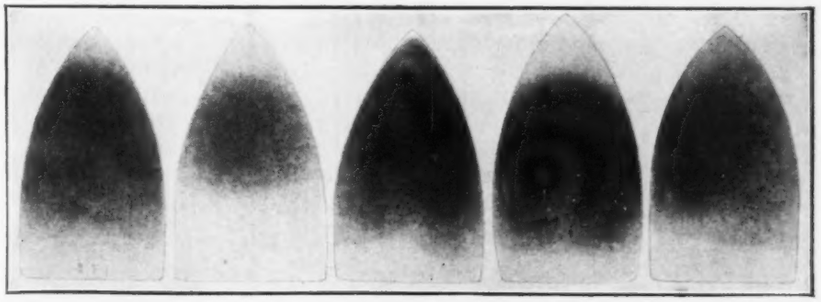
II. *Power Consumption.*—The power consumption of each iron of each brand was measured on alternating current (60 cycles) immediately after the application of the voltage and again after the iron had attained operating temperature. The power consumption was also measured on direct current with the iron at the higher temperature. All of the above tests were made at rated voltage or at the average voltage where a range of voltage was given on the name plate.

III. *Temperature Tests.* — Temperatures were in general measured with thermocouples and indicating millivoltmeters. In measuring the temperatures of wooden handles, spring wire guards, etc., the thermocouples were soldered to thin copper sheets which were wrapped around the part under test. To determine the temperature distribution of the sole plates the scorch test was employed. The procedure was to leave the iron on a continuous-flow calorimeter until normal temperature was reached. The iron was then set on a blotter for thirty seconds, at which time a satisfactory scorch was usually produced. The blotters had previously been dried in an oven at 105 deg. C.

IV. *Stability.*—In the stability tests the minimum force required to overturn one iron of each brand was measured. A flexible cord was attached to the handle of the iron and run over a frictionless pulley. Fine sand was poured into a scale pan attached to this cord until the iron overturned, after which the sand was weighed.

V. *Efficiency.*—To measure the efficiency a continuous-flow calorimeter was developed. It consisted of a hollow box of highly polished metal upon which the iron rested and through which cooling water circulated. Thermometers indicated the temperature of incoming and outgoing water. The difference between their indications multiplied by the rate of the flow of the cooling water was a measure of the heat passing from the sole plate of the iron into the water.

VI. *Heating and Cooling.*—One iron of each brand was left on its stand while connected to a circuit of rated voltage. The temperature in the sole



SCORCH TEST SHOWS TEMPERATURE DISTRIBUTION OF SOLE PLATES

plate was measured with an embedded thermocouple, the thermo-junction being at a point about two inches from the rear of the iron along the center line and at a distance of approximately ¼ in. from the outer surface. The current was left on until the iron had reached a maximum temperature, after which the current was turned off and the iron allowed to cool down. Temperature readings were taken from time to time throughout the test. The watt-hours required to bring the sole plate to a temperature of 300 deg. C. was also noted.

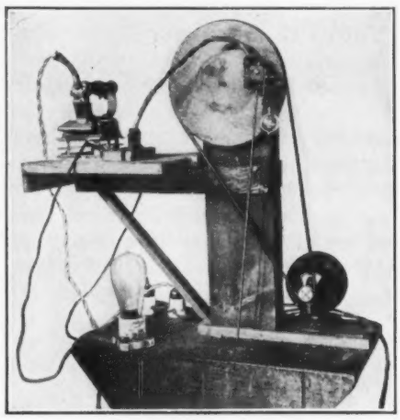
VII (A). *Durability Tests, Bumping.*—The bumping tests were made with the apparatus illustrated. The connecting rods were securely clamped to the irons so that their weight (2½ lb.) added to the severity of the test. The iron plate used as an anvil weighed 16 lb. and was supported on soft-rubber cushions. The irons dropped a distance of 1¾ in. forty-five times per minute. Throughout the tests rated voltage was applied to the irons. Pilot lamps (not shown) indicated grounds, open circuits or short circuits in the heater element. The stands were tested by substituting them for the iron plate.

VII. (B). *Durability Tests, Repeated Heating and Cooling.*—Air was blown upon the iron as a cooling medium. In this test current was applied for fifteen minutes, after which current was cut off and a blower applied for a like period.

VII (C). *Durability Tests, Continued Heating.* — The irons were suspended in the open air while connected to a circuit whose voltage was approximately 10 per cent higher than the rated value of the irons under test. Pilot lamps indicated electrical failures as they occurred.

VII (D). *Durability Tests, Contacts and Plugs.*—The contacts and plugs of one iron of each brand were tested with direct current at rated voltage. Contacts were made and broken by hand at approximately one-minute intervals. From time to time the force required to separate the plug from the iron was measured with a spring balance.

VII (E). *Durability Tests, Cords and Cord Protectors.*—The cord from one iron of each brand was tested with the apparatus shown. The speed of rotation of the large wheel, which carries one end of the cord, was approximately four revolutions per second.



APPARATUS FOR BENDING TEST OF CORDS

Pilot lamps indicated when failure occurred. In all tests, rated current (approximately 5 amp.) was passed through the cord.

VIII and IX. *Insulation Resistance and High-Voltage Tests.*—A voltage of 500 volts at 60 cycles, obtained from a transformer, was applied between the heater element and the shell of the iron. A rectifier, driven by a synchronous motor, and a direct-current galvanometer were connected in series with this circuit. By suitable adjustment of the phase of rectification the galvanometer read the in-phase component of the current flowing through the insulation. Insulation resistance was computed from the galvanometer readings used in conjunction with a constant obtained when the standard resistor was substituted for the iron under test. By applying direct current to the heater element the insulation resistance could be measured while the iron was heating.

In summarizing the outstanding features of the results of the tests Chairman Hale makes the following observations:

The first test, of course, was the judgment of the central-station man on the brands, placing them in the order A, B, C, D and E. It is important to note that this was not unanimous, that not everybody placed the iron which is noted above as A as the first, nor did every one place the iron noted as E as the last.

In the continued heating test only one iron of each brand was tested. This test was made at 10 volts higher than the rated voltage of the iron, or in case an iron was rated at 2 voltages, as 110 to 120, the test was made at 10 volts above the intermediate value of the two ratings. The results were as follows:

	Flatiron				
	A	B	C	D	E
Hours to 95 per cent initial watts	700	660	670	450	300
Hours to 90 per cent initial watts	930	*	*	*	*
Hours to failure	†	800	†	†	400

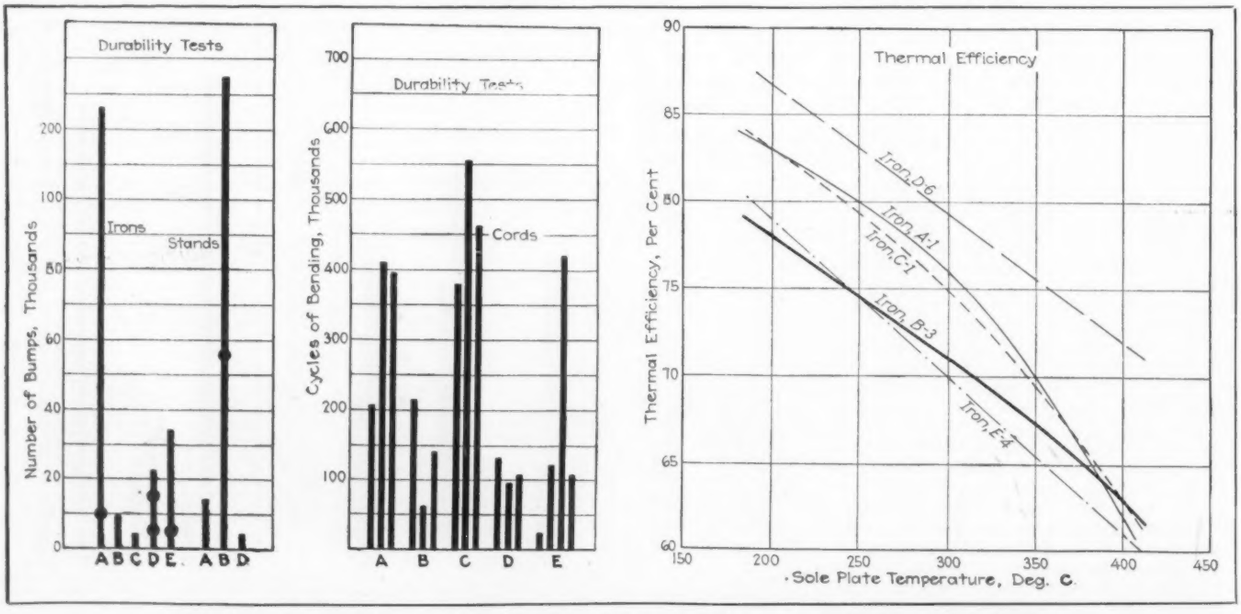
* Did not fall off 10 per cent.
† Had not failed at 1,000 hours.

Of these tests it is obvious that iron A might possibly be criticised for falling off in consumption below 10 per cent, indicating that when it got old it would not do so much work as when new, even though still operating. In view, however, of the test being made at 10 volts over rating, the results probably show entirely satisfactory life. B and E failed, while C and D stood up well. B and E might, of course, last as well as A, C and D if used only at rated voltage. C possibly gained its long life at the expense of efficiency as noted below, though D with a long life was even more efficient than A.

The test on the average thermal efficiency showed the following:

	Flatiron				
	A	B	C	D	E
Per cent efficient	79	76	75	80	70

A and D are evidently the best and E not at all good.



RESULTS OF DURABILITY TESTS, AND THERMAL EFFICIENCIES AT DIFFERENT TEMPERATURES

On the bumping test, the results were as follows:

	Flatiron				
	A	B	C	D	E
Bumps to first failure.....	10,000	....	....	6,000	5,000
Bumps to complete failure..	126,000	9,000	4,000	22,000	34,000

On these tests iron A evidently stood up very well indeed, the others not so well.

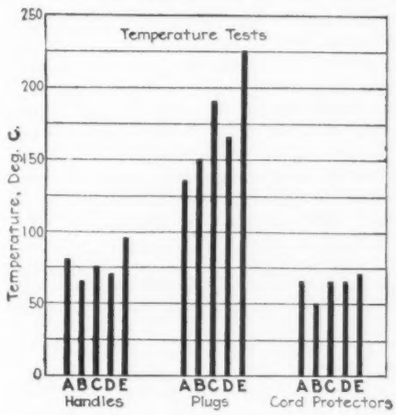
The test on plugs and connectors was performed by having a boy connect and disconnect the iron from the circuit under load. The force necessary was measured at intervals by a spring balance.

The results were as follows:

	Flatiron				
	A	B	C	D	E
Cycles to failure....	2,400	2,400	*	2,600†	2,600

* Had not failed at 2,600 cycles. † D during the test developed considerable friction, requiring undue force to connect and disconnect.

The next test was on the cords and protectors, a special machine being used



TEMPERATURES OF HANDLES, PLUGS AND CORD PROTECTORS

to swing the cord through a circle as might be done in practice. The results were as follows:

	Flatiron				
	A	B	C	D	E
Average cycles to failure....	336,000	138,000	467,000	109,000	167,000

DIELECTRIC TESTS

All irons when cold stood the standard A. I. E. E. test of 500 volts alternating current. When hot, however, four irons broke down under this test, two from brand B and two from brand E. The insulation resistance when cold was satisfactory with the exception of one iron from brand E, which was very bad. When hot all the irons showed satisfactory insulation resistance with the exception of four, two from B and two from E, which broke down under the dielectric pressure.

The general result of the above tests is that until better tests are devised we recommend that the following be used:

1. Determination of thermal efficiency at the various temperatures of the sole plate, including power consumption, measurement, cold and hot.
2. Durability under continuous heating.
3. Mechanical durability—iron only (i. e., excluding stand)—when subjected to the standard bumping test.
4. Durability of the plug connection when subjected to repeated make-and-break tests.
5. Test of the dielectric strength according to the standard A. I. E. E. test made both hot and cold, and at the end of 1,000 hours run under the continued heating test and at the end of 5,000 bumps under the bumping tests.

All the tests are to be made by the standard methods as developed.

It is our opinion that when a new iron is brought out the use of tests as described above will serve to classify it as a good, medium or indifferently poor iron as compared with those on the market at present and that a classification by such tests will be of use to purchasers.

The further development of tests will depend on the desire of purchasers to know what irons, etc., will do under test and on the willingness of manufacturers to have their irons judged by tests as well as by inspection and reputation.

The use of tests depends largely on there being available tests of irons known to be good, medium or poor, with which tests of a new iron may be compared. The tests of flatirons here published cover these requirements to a certain extent.

It is planned to conduct tests of a few more irons, and an endeavor will be made to pick out the brands on which information is most desired. If companies will advise the chairman of the division, R. S. Hale, at 39 Boylston Street, Boston, as to the brands which they think it most desirable to have tested, the tests will be made on those brands for which there is the most demand.

Central Station Takes Part in Community Activities

THE Empire Gas & Electric Company of Auburn, N. Y., endeavors to co-operate in every possible manner with local community movements, and an interesting example of this policy is seen in the company's participation recently in a "Dollar Day" sale staged by the retail merchants' division of the Auburn Chamber of Commerce. This day was something of an event in the city, involving considerable planning and advance preparation to make it a success. Direct-by-mail advertising was sent out, and about a week in advance the merchants of the city arranged a motor trip which took in many of the outlying towns, villages and rural districts. At this time other advertising literature was distributed and the daily press got out two bargain editions on the eve of the sale. All of this publicity led to an unusual response from the public.

To help make the day one of uniform interest to buyers, the Empire Gas & Electric Company offered substantial reductions on its household appliances. The public was invited to visit the company's salesroom, where various appliances were put on special demonstration. It was found that many people availed themselves of this opportunity to obtain one or more of the standard appliances which were being offered.

While the company does not follow a policy of price cutting and while reductions of this kind eat up profits, its participation in the general sale helped to increase the merchandise turnover and was the means of making more friends.

What Other Companies Are Doing

Lineville, Iowa.—The municipal electric light plant here has been sold to the Lineville Light & Power Company, which will install additional generating equipment and rehabilitate and extend the distribution system. The company is also preparing to handle electrical appliances.

Providence, R. I.—A new record in the sale of electric washers was established recently by the Narragansett Electric Lighting Company, which sold 226 machines in thirty selling days. Of these, 130 were sold in the first fifteen days, and in one week orders were received for forty-two machines which could not at the time be filled owing to the unexpectedly large demand. An installment plan of $1.50 per week was adopted. Newspaper advertising, circularizing and personal solicitation were utilized, and this record was made in spite of a widespread textile strike in the territory. A. H. Allcott is manager of the company's electric shops.

Chicago, Ill.—The electrical energy output of all plants of the Standard Gas & Electric Company for the week ended Oct. 31 increased 11.4 per cent over the same period in 1921. The connected load gained 1,074 customers with 749 kw. of lighting. Applications were received for 2,346 new electric services, covering 1,177 kw. of lighting and 452 kw. in motors.

Louisville, Ky.—Gross earnings of the Louisville Gas & Electric Company in the twelve months ended Sept. 30, 1922, amounted to $5,339,267, an increase of $493,801 as compared with the previous twelve months; the net earnings were $2,507,803, an increase of $313,072, or 14.26 per cent.

Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
from All Parts of the World

Hydro-Electric Development and Steam Equipment

Power Development of Georgia Railway & Power Company on Tallulah and Chattooga Rivers.—H. M. ATKINSON.—A review of the water-power development program of the Georgia Railway & Power Company on these two rivers since the organization of the company in 1911 is given. The three undertakings in the carrying out of this program—namely, the Tallulah Falls generating station, the Mathis reservoir and the Burton reservoir—have been completed and are in operation. The total installed capacity of the Tallulah Falls plant is 102,000 hp. This plant now serves fifty-one municipalities in northern Georgia in addition to hundreds of large manufacturing industries. The Mathis reservoir is on the Tallulah River, about 6 miles from the intake dam of the generating station, which is about 1½ miles up the river from the Tallulah Falls generating station. This reservoir will store 1,369,000,000 cu. ft. of water. The Burton dam is about 14 miles from the Mathis dam and 21 miles from the power house. The greatest capacity of this dam is 5,280,000,000 cu. ft. of water. Ten photographs, showing the power station and the various dams and reservoirs, are included.—*Manufacturers' Record*, Nov. 2, 1922.

Fuel Economy in Steam Power Plants.—J. B. C. KERSHAW.—The utilization of waste heat from steam boilers is the subject of the fourth article of this series. After showing by calculation the amount of heat likely to be recovered from exit gases, the principles and practical design of economizers for the purpose are considered, many test results and figures from actual practice being given. A further source of heat recovery lies in the preheating of the air supply to the boiler furnaces, and the author shows that this is deserving of more attention than is usually given. Several types of air-heaters and recuperators are discussed.—*Beama*, October, 1922.

Generation, Control and Switching

Efficiency of Overlapping Joints in Copper and Aluminum Busbar Conductors.—S. W. MELSOM and H. C. BOOTH.—An investigation was carried out by the authors to determine the amount of contact resistance between the surfaces of an overlapping joint in rectangular straight-busbar conductors of copper and aluminum under various conditions of surface preparation and pressure, with the particular purpose of ascertaining the efficiency of such joints. Numerical results are deduced and tables and graphs given for the contact resistance per unit of surface area under various conditions of pressure and amount of overlap and after various modes of cleaning and preparing the surface, including the interposition of tinfoil and the soldering of the two bars together. A series of graphs is given which shows the efficiency of copper and aluminum joints in terms of a defined standard with a wide range of busbar sizes. The effect of modifying the numbers, size and position of the bolts used to hold busbar sections together was also investigated.—*Proceedings of (British) Institution of Electrical Engineers*, Vol. 60, No. 312.

Runaway Speed of Turbines.—P. ATTLMAYER.—Properly chosen regulators make the actual running away of water turbines an extremely rare occurrence. But if it should actually happen, serious danger may be avoided to any extent by providing a sufficient amount of flywheel mass in the driven generator. An example is cited of a 1,000-hp. generator operating at 500 r.p.m. with a Mr^2_g of 7,850 kg.-m.², which accelerates to a dangerous speed of 800 r.p.m. within eight seconds if its load is lost. If this same generator were provided with a Mr^2_g of 15,700 kg.-m.², twice the time would be required to reach that critical speed, giving the attendant more chance to cope with the situation. A curve diagram is given to determine the time within which a generator reaches a runaway speed.—*Elektrotechnik und Maschinenbau*, Oct. 15, 1922.

Transmission, Substations and Distribution

Application of Schwarz's Theorem to Problems of High-Tension Transformer Design.—L. DREYFUS.—An electric discharge under oil probably takes place when the line integral of field strength, taken over a certain finite length—i.e., across the "ionization zone"—exceeds a definite value, the "edge voltage." At the end point of the integration path there exists a certain critical field strength, which the author assumes to be identical with the dielectric strength of oil in a homogeneous field. By a skillful application of the theory of conform images (Schwarz's theorem) the author succeeds in reducing a great number of high-tension problems involving sharp edges into forms which permit of analytical treatment leading to expressions for the disruptive voltage in terms of the distance between the electrodes and a certain constant which experiments have proved to be dependent only on the properties of the oil and which involves the edge voltage and the dielectric strength of the oil. By use of a special transformation the author also investigates the effect of a rounding of the edges. The methods developed are applied to a great number of problems concerning transformer design.—*Teknisk Tidskrift*, June 10, Aug. 19 and Sept. 30, 1922.

Present Status of High-Voltage Transmission of Power—Part II.—W. W. LEWIS.—This installment of the article concludes the subject of high-voltage transmission with a discussion of synchronous condensers, characteristics of long lines, transformers, oil circuit breakers and bushings. Part I, appearing in the October issue, treated of the present limit of transmission voltage, line insulations, corona, grounded neutral, protection and charging the line. It also included tabulated data on 160 transmission systems whose circuit voltages are 66,000 or above.—*General Electric Review*, November, 1922.

Failure of Disk Insulators on High-Tension Transmission Lines. — H. D. PANTON. — Accurate information showing the actual operating performance of insulators during a period of years is included in this article, prepared for the Vancouver convention. A 300-word abstract will be found in the *Electrical World* convention report, Aug. 26, 1922, page 426.—*Journal of the A. I. E. E.*, November, 1922.

Units, Measurements and Instruments

A Million-Volt Testing Set.—A. B. HENDRICKS, JR.—The new 1,000,000-volt, three-phase equipment described should be valuable, the author thinks, in magnifying the possible troubles which may arise in the 220,000-volt practical installation—that is to say, such troubles as may arise from the electric pressures now being pushed above the known field of operation. Moreover, the testing set will have its uses in the near future for various researches in insulation, ionization, spark discharges, lightning, high frequencies, designs of apparatus and so forth. The design and construction of the three 500-kw., 578,000-volt transformers and of the 500-kw. insulating transformer composing this set are described in this article, together with many illustrations of the apparatus and voltage discharges up to as high as 1,500,000 volts.—*Journal of the A. I. E. E.*, October-November, 1922.

Production and Measurement of High Vacua.—F. H. NEWMAN.—The increasing importance of the complete exhaustion of gas in a thermionic valve is emphasized. The greater part of the gas is removed by mechanical oil-sealed pumps of which the piston and rotary types are described. The evacuation is then completed by mercury pumps and by the use of charcoal cooled by liquid air. Of the various measuring devices for high vacua, the

author describes the McLeod, Kundsen, Langmuir and Buckley gages.—*Beama*, November, 1922.

Illumination

Theory of End-Loss Corrections and Its Application to Uniform, Electrically Heated Tungsten Filaments in Vacuo.—A. G. WORTHING.—A method for computing end-loss corrections and applications of it to the case of uniform, electrically heated tungsten filaments in vacuo are the main subjects considered. In the case of long filaments, several expressions are derived for the temperature, resistivity, emission intensity, brightness and thermionic emission distributions near a cooling junction. Those computed for tungsten were found to check observed distributions closely. For short filaments the relation of the distribution curves to those for long filaments is shown, and it is pointed out that there is a family of reduced distribution curves from which any one desired curve may be obtained. Equations and conclusions developed for cylindrical or wire filaments apply equally well to filaments with rectangular and other cross-sections when the ratio of twice the cross-section to the perimeter of the filament is substituted for the radius of the cylindrical filament.—*Journal of the Franklin Institute*, November, 1922.

Motors and Control

Universal Chart Method of Calculating Starting Rheostats for Direct-Current Motors.—A. T. DOVER.—The calculation of the resistance of the sections of a starting rheostat for a series motor requires a knowledge of the magnetization curve of the motor as well as a determination of two "grading" coefficients. A number of graphical and analytical methods of calculation have been proposed, but these give the solution only for a particular number of sections. The method presented by the author has the same order of accuracy as analytical methods, but it enables the grading coefficients corresponding to several numbers of sections to be obtained simultaneously from a single set of preliminary calculations. The basis of the method is the use of charts of grading coefficients that are calculated for various numbers of sections, definite values of the percentage pressure drop in the motor at full load, and given starting conditions. The complete calculation of the starter can be carried out in a few minutes. A number of worked examples are included, illustrating the application of the method.—*Proceedings of (British) Institution of Electrical Engineers*, Vol. 60, No. 312.

Heat Applications and Material Handling

Refractory Materials for Electric Furnaces.—A. B. SEARLE.—The limitations of the electric furnace, as every operator knows, are largely bound up in the range of refractory materials available for building and lining the furnaces. In this article the author describes and classifies the various types of refractory materials in use at the present time, pointing out their deficiencies and their advantages. Among the materials now used are silica brick, grog brick (composed of burned fireclay in a small proportion of raw fireclay), bauxite bricks, corundum, alundum bricks, magnesia bricks, carbon or graphite bricks, zirconia and zircon bricks and carborundum bricks.—*Beama*, October, 1922.

Electric Melting Furnaces for Metals and Alloys.—J. RITZ and G. KELLER.—On account of the scarcity of fuel and labor during the war the development of electric furnaces and their accessory apparatus was actively pursued, so that at the present time electric melting furnaces are more than able to hold their own against the older types of furnaces, which they are gradually displacing. The construction and advantages of several types of melting furnaces are set forth in the article.—*Brown-Boveri Review*, October, 1922.

Electrophysics, Electrochemistry and Batteries

Experiments in Electrical Prospecting.—Any mineral mass which possesses metallic electrical conductivity throughout a sufficient depth and which lies underground in such a fashion that part of it rises above the water table produces in the surrounding moist terrain electrical currents observable by the differences of potential which they produce. This principle is the basis on which experiments in electrical prospecting were carried out. The entire phenomenon is explained, as is the manner of utilizing these currents to determine the presence of minerals. The results of field work in various metal mines in the United States and Canada made by the author are presented. The most important application of this method is its value in the preliminary determination of advantageous locations for diamond drilling. Coal is also subject to satisfactory tests.—*Engineering and Mining Journal-Press*, Oct. 7 and 14, 1922.

Traction

Diesel-Electric Railroad Cars.—E. HUBENDICK.—While German designers of Diesel-driven railroad cars have reverted to earlier types with gear shift and friction clutch, Swedish engineers have continued to develop the Diesel-electric car, with electric transmission from Diesel motor to driving wheels. This type of automotive car has given very good results in service, and there are indications that by its aid the difficult problem will be solved of keeping up in an economical way frequent passenger accommodations on roads in outlying districts. Besides two earlier Diesel-electric cars of limited capacity, two new types have been developed, one weighing 37 tons, with a 160-hp. engine, the other a 50-ton car, with a twelve-cylinder, 250-hp. Diesel engine. Two cars of the 37-ton type which have been hauling 80-ton trains during six months of the year 1921 gave an average oil-fuel consumption of 0.45 kg. to 0.61 kg. per train-kilometer, the higher figure applying to a road with numerous heavy grades.—*Teknisk Tidskrift*, Sept. 2 and 9, 1922.

Telegraphy, Telephony, Radio and Signals

Quantitative Analysis of the Thermionic Tube Oscillation Generator.—In most practical cases a thermionic tube when used for the generation of electric oscillations is operating under conditions which invalidate the assumptions necessary for a simple mathematical discussion of the subject, i.e., the rectilinearity of the characteristics. To take account of the actual shape of the characteristics of the tube means to take the matter outside the scope of mathematical treatment. A method is outlined for the exact quantitative analysis of these characteristics. Two types of generators are considered—(1) a separately excited generator in which the generation of oscillations in a circuit inserted between the anode and filament is done by means of an alternating potential due to some external source applied to the grid; (2) a self-excited or back-coupled generator.—*Electrician*, Nov. 10, 1922.

Portable Short-Wave Radio Wavemeter.—The design of a portable short-wave wavemeter is a matter of importance to amateurs who are required by law not to use wave lengths exceeding 200 m. This circular points out the most important considerations in the design of such a wave meter and describes the construction of a meter suitable for the measurement of frequencies corresponding to wave lengths of from 100 m. to 570 m. As only a few mimeographed copies of this circular are on hand, its circulation is limited.—*Circular Letter No. 78 of the Bureau of Standards.*

Miscellaneous

Seventy-five Years of Electrical Development.—This year the German Siemens company celebrates its seventy-fifth anniversary and devotes the October issue of its publication to a commemoration of some of the larger achievements made during the last three-quarters of a century. The bibliographer and technical historian will find a host of material and valuable pictures of electric machinery from days long past in the 125 well illustrated pages. Some of the main subjects are "From Indicating Telegraph to the Modern Machine Telegraph (1846-1922)," "Development of the Fire Telegraph System (1851-1922)," "Measurement of Liquids and Gases Flowing Through Pipe Lines," "Development of the Alternating-Current Wattmeter," "Progress in Dynamo Design," "Fifty Years of Carbon Manufacture" (for arc lights, electrodes and brushes), "Development of Railway Signal Systems," "The Telephone from 1880 to 1922," and "The History of Electric Railways."—*Siemens Zeitschrift*, October, 1922.

News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rulings and News of Electrical Men

I. E. C. Meeting at Geneva

Two Ratings for Industrial Motors—Lamp Bases Standardized—New High-Voltage Ratings

By Special Radiogram from Geneva

THE committees of the International Electrotechnical Commission met at Geneva, Switzerland, on Nov. 20 to 25, with fifty-eight delegates present, representing twelve countries.

After three days of discussion, the advisory committee on rating adopted the British proposal recognizing for certain classes of industrial motors the rating standard of 40 deg. C. rise with 25 per cent overload for two hours without exceeding the I. E. C. maximum temperature,* the I. E. C. equivalent rating also to be indicated.†

The committee on graphical symbols after three days adopted many proposals.

Forty-five kilovolts and 120 kv. were added to the list of standard voltages. The committee rejected emphatically the British proposal standardizing 220-440 volts as a distribution standard.

The Edison base committee approved the American proposal adopting in principle the universal "mogul" and medium socket to take the place of all existing bases, details to be settled by a committee of manufacturing experts. Other bases, such as candelabra and miniature, were left for further investigation.

The German delegates participated in the work of all of the committees.

According to reports from England, the British Commission, whose proposals have thus apparently been adopted by the rating committee of the I. E. C., was instrumental in bringing about the present rating committee meetings in Geneva. British industry, according to these reports, found itself unable to conform to the old I. E. C. method of rating (that is, 50 deg. C. rise continuous maximum rating with no sustained overload) in the case of a considerable portion of the electrical machinery made in Great Britain. The British made the statement that in the case of motors and generators for ordinary industrial purposes the fact that 95 per cent of British business relates to machines for which the industry demands a sustained overload could not be ignored.

* The I. E. C. maximum temperature rules are:
Highest Permissible Observable Temperatures

Class	Kind of Insulation	Temperature, Deg. C.
1	Cotton, paper and silk, non-impregnated	80
2	Cotton, paper and silk, impregnated	95
3	Cotton, paper and silk immersed in oil	95
4	Enameled wire	95
5	Mica, asbestos, glass, porcelain, micanite and similar compositions	115
6	Insulated windings, permanently short-circuited	100
7	Non-insulated windings, permanently short-circuited	110
8	Oil	
9	Commutators and slip rings	90
10	Bearings	80
11	Iron core immersed in oil	95
12	Iron core in contact with winding	To be same as winding

In the United States insulation is divided into two classes, A and B, class A being that principally under discussion in the rating of motors, and in America the highest permissible observable temperature is interpreted as being 90 deg. for this class, the highest internal temperature, with a 15-deg. conventional allowance, being 105 deg.—*Editors.*

† By I. E. C. equivalent rating seems to be meant the rating of the motor on the basis of 50 deg. rise under continuous service with no provision or guarantee for sustained overload.—*Editors.*

Five-Day Service Forced

Drought Compels Southern Power to Curtail Service Temporarily—Effect of Fuel Shortage

THE Southern Power Company has served the long-contemplated notice on its industrial patrons that because of drought it is compelled to suspend service for one day a week. The suspension began last Monday for plants in a certain specified district. The next day service in other territory was suspended for the day. This was continued for five days, until the five districts into which the territory served has been divided had each had one day's curtailment. The same program will probably be continued next week and indefinitely until the situation is relieved by copious rains on the headwaters of the Catawba and other streams on which the power plants of the Southern Power Company are erected. The suspension does not apply to municipalities and other users of power for public purposes.

The notices were sent out over the signature of Charles I. Burkholder, vice-president of the company. Commenting on the situation, Mr. Burkholder said that the action was taken now rather than to compel the company to face the prospect of a more serious situation later. The limited coal supply for several weeks in the summer compelled heavy drawing of the reserve supply of water, and the water heads have been pulled down so low that the generating capacity is reduced and there is danger of putting the water plants out of commission unless the greatest care is exercised now. The power company, in addition to the two immense water plants which are now in course of construction, has given orders for the construction of two additional steam plants.

Constitutional Change Fails

Wisconsin Defeats Overwhelmingly Proposal in the Interest of City Ownership

COMPLETE election returns given out by the Wisconsin Election Commission indicate that the proposed amendment to the state constitution to permit any municipality to increase from 5 per cent to 10 per cent that portion of its bonded indebtedness which may be incurred for the purpose of acquiring or building street-railway properties or buying properties for the production, transmission, delivery or furnishing of light, heat, water or power to the public was overwhelmingly defeated on Nov. 7, when a referendum vote on the proposed change was taken. Virtually all the communities in the state gave a majority against the amendment.

Stock Issues in New York Metropolitan District

Various issues of public utility stock in the metropolitan district embracing New York City and contiguous territory have been announced in the last week or two.

The Consolidated Gas Company has authorized an issue of 300,000 shares of 6 per cent cumulative participating preferred stock, of the par value of $50 each, and has offered the same for subscription to employees and consumers of the company or any subsidiary corporation, under such terms and for such consideration as may hereafter be decided upon.

Three subsidiary companies of the Consolidated Gas have obtained permission from the Public Service Commission to issue additional common capital stock. These companies and the amount of the issuances granted are: New York Edison Company, $14,000,000; Astoria Light, Heat & Power Company, $7,500,000, and New York & Queens Electric Light & Power Company, $7,100,000. The new stock of the New York Edison Company is to go to the Consolidated Gas in liquidation of loans, as is also the new stock of the Astoria company and $3,700,000 of that of the New York & Queens. The remaining $3,400,000 of the latter company's issue is to be exchanged, par for par, for ten-year 7 per cent debentures.

Two changes in the capitalization of the Public Service Corporation of New Jersey have been decided upon, described by President Thomas N. McCarter as follows:

"At present the authorized issue of preferred stock is $50,000,000 at par,

carrying 8 per cent cumulative dividend, of which approximately $18,500,000 is outstanding. This stock is redeemable at 110 per cent of its par value, but as this tends to keep down the price of the issue to the redemption figure, the stockholders will be asked to waive this provision.

"The directors of the company also felt that there would be times hereafter when it would be practicable for the corporation to sell 7 per cent preferred stock and have therefore decided to recommend to the stockholders for approval the alteration of the company's charter so that the $50,000,000 of authorized preferred stock shall hereafter consist of $25,000,000 of 8 per cent preferred stock and $25,000,000 of 7 per cent preferred stock."

The directors of the Public Service Corporation of New Jersey have declared a quarterly dividend of $2 a share on the common stock, placing it on an annual basis of $8. The previous quarterly payments have been $1.50, or $6 annually, the disbursement having been increased from $1 quarterly in March, 1922.

Boston Edison Stock Issue

The judgment of the Edison Electric Illuminating Company of Boston that its immediate financing should be done by the issue of new capital stock instead of bonds was sustained in a decision of the Massachusetts Department of Public Utilities last week, which authorized the issuing of stock of the par value of $5,406,700 (yield value $8,110,050) to meet liabilities incurred prior to Oct. 31, 1922. A résumé of President Edgar's discussion of the policy of the company before the commission was published in the *Electrical World* for Nov. 25, page 1168.

Harrison Williams' Interest in Republic Company Sold

It is officially announced that R. P. Stevens and his associates in New York City and Youngstown, Ohio, have purchased from Harrison Williams and associates their interests in the Republic Railway & Light Company, which through its subsidiaries, the Pennsylvania-Ohio Electric, the Pennsylvania-Ohio Power & Light and the New Castle Electric companies, owns and controls virtually the entire electric light, power, local and interurban electric railway business in the industrial district between Pittsburgh and Cleveland. The territory served comprises about 600 square miles with a population of more than 300,000.

At a meeting of the board of directors, held on Nov. 21, John T. Harrington, John R. Rowland, Herbert L. Dillon, Henry L. Bogert, Jr., and Walter H. Nash were elected to succeed Harrison Williams, R. E. Breed, F. L. Dame, Edwin Gruhl and Robert Lindsay, resigned. These new members, together with R. P. Stevens, Anson W. Burchard, Clarence L. Harper and G. T. Seely, who remain, will constitute the board.

A. S. M. E. to Discuss Power, Fuels and Safety

Two sessions of especial interest to electrical engineers will be held by the American Society of Mechanical Engineers in the course of its annual convention at New York City on Monday to Thursday next week, Dec. 4 to 7.

On Wednesday morning there will be a joint session with the Stoker Manufacturers' Association on fuels, when these papers will be presented: "Chronological History of Stoker Development to the Present Day," A. H. Blackburn; "Overfeed Stokers of the Inclined Type," G. I. Bouton; "Design and Operation of Underfeed Stokers," H. F. Lawrence, and "Development and Use of the Modern Chain Grate," T. A. Marsh.

On Thursday morning there will be a power session with this program: "The Commercial Economy of High Pressure and High Superheats in the Central Station," G. A. Orrok; "Feed-Water Heating for High Thermal Efficiency," L. Helander; "Tests of Stirling Boiler of Detroit Edison Company's Connors Creek Station," P. W. Thompson; "Elasticity of Pipe Bends," D. Crocker and S. S. Sanford, and "Transmission of Superheated Steam," B. N. Broido (by title).

At a joint session on the same morning with the American Society of Safety Engineers M. C. Goodspeed will discuss "The Development of Safety Codes," M. G. Lloyd "Safety Codes," and A. D. Risteen "Safety Engineering in Connection with the Compression of Gases."

Birmingham Fighting Public Service Commission

A determined fight upon the power and authority of the Alabama Public Service Commission in its control of the rates, finances and service of public utilities is being conducted by the city of Birmingham through William L. Harrison, Commissioner of Public Utilities, who was formerly an organizer for the United Mine Workers of Alabama and is still a leader of labor in the state. The cities of Mobile, Cullman, Albany, Sheffield, Marion, Troy, Hartsells and Attalla have lined up with Birmingham, while Montgomery, Selma and a few others have declared against the plan for "home rule" of public utilities.

The present City Commission of Birmingham has been at loggerheads for some time with the Birmingham Railway, Light & Power Company over the question of franchises, street-car fares and the extension of lighting facilities. In a letter sent out last week to all members of the next Legislature Commissioner Harrison asks support of a bill giving cities the right to control their utilities. He asserts that he is making no fight on public utilities themselves, but for the control of rates and service. Complaint is made that persons with complaints have to employ attorneys to appear at Montgomery before the Public Service Commission.

A. G. Patterson, president of the Alabama Public Service Commission, has issued a statement opposing the "home rule" movement. He declares that the removal of hydro-electric plants from state jurisdiction might place them under the supervision of the Federal Power Commission, which is further removed from the citizens. Mr. Patterson also calls attention to the fact that the expert engineers in the employ of the commission are capable of ascertaining the real values of the utilities and verifying their reports of earnings. Cities, he points out, do not have these experts. Referring to the Birmingham situation, he points out that the Birmingham Railway, Light & Power Company operates in several incorporated towns and that it would be impossible for one city to control all its operations.

Reorganization of Union Electric Light & Power

As a step in the financial reorganization of the Union Electric Light & Power Company of St. Louis a charter has been granted to the Missouri Electric Light & Power Company, which will take over the franchises, physical property and other assets of the Union Electric Light & Power Company and will later take over the name of Union Electric Light & Power Company. The new company is to have an authorized capital stock of $25,000,000 in preferred and 650,000 shares of no-par common. Of the preferred stock, $6,000,000 will be issued in exchange for the $6,000,000 of outstanding preferred of the Union Electric Light & Power Company, and additional preferred shares will be issued as the expanding business of the company requires. This financial reorganization is a part of the plan of the company to expand its business and increase its facilities in St. Louis and the surrounding territory.

Portland Company Orders a 35,000-Hp. Turbine

An order for a 35,000-hp. hydraulic turbine has just been placed by the Portland (Ore.) Railway, Light & Power Company for its Oak Grove project. The turbine is of the Francis or reaction type and will operate at a speed of 514 r.p.m. under an effective head of 857 ft. The unit was purchased from the Pelton Water Wheel Company of San Francisco and will constitute a world's record both in capacity and operating head for a reaction-type turbine. It will be similar to the Francis turbines at the Kern River No. 3 plant of the Southern California Edison Company, which have a rating of 25,000 hp. operating under a head of 610 ft. and which have stood as a world's record for reaction turbines up to this time.

Utility Extension Rules

New Jersey Commission Invites Companies and Municipalities to Discuss Proposals

GENERAL rules and regulations proposed for the government of extensions by electric light and power companies will be the subject of a hearing called by the New Jersey Board of Public Utilities Commissioners for Dec. 7 at Trenton, N. J., to which public utilities, chambers of commerce, boards of trade and incorporated towns have been asked to send representatives. Among the rules and regulations which the board favors and which will be discussed at the hearing are the following affecting electric supply companies:

"Where applications for extensions into newly developed tracts of land are made by individuals, partnerships or corporations interested in the development and sale of land, but not as ultimate residents, the utility may require a deposit from the applicant covering the entire cost of installing the necessary main lines to serve the tract. These deposits are to be returned to the depositor when and as new houses are completed and occupied.

"Upon application for extension to reach a house not already served with electricity, gas or water, an estimate shall be made of the cost of making such extension to serve the applicant and an estimate shall also be made of the anticipated normal revenue from this extension.

"Where the cost to the utility for an electric extension does not exceed three times the estimated normal annual charge for service at regular rates, the utility shall make the necessary extension upon receiving from the applicant the properly signed standard form of application for service; such application, however, to be for an indefinite period.

"Where the cost of making an extension exceeds the amount which the utility, under one plan, must install without special guarantee, the excess cost of the extension shall be deposited with the utility and remain, without interest, in the possession of the utility until such time as the revenue from the particular extension is sufficient, when it shall be returned pro rata to the depositor."

Under another plan the applicant for the extension shall guarantee the utility a monthly revenue equivalent to one-thirty-sixth of the total cost of the extension if electric, one-twenty-fourth of the total cost of the extension if gas, or one-forty-eighth of the total cost of the extension if water; provided, however, that the utility shall not be required to accept a guaranty of more than 50 per cent above the normal charge for service to the particular applicant.

Jobbers, in Convention, Resolve to Help Dealers

Definite action was taken last week at the annual winter convention of the Electrical Supply Jobbers' Association in Cleveland to develop stronger practical co-operation with the dealer. This purpose was expressed throughout the sessions and in the corridors and received confirmation in the adoption of a resolution providing for a committee of three members to confer with the association counsel in the matter.

Declaring that the pay-as-you-use plan has been clearly demonstrated as the chosen policy of the American people, John H. Gilchrist, vice-president Commonwealth Edison Company, gave some interesting figures on the experience of his company in selling electrical appliances. He discussed at length the position of the dealer today and dwelt on the thought that if the central-station company of any community does not conduct its retail business on a basis that enables the small dealer to succeed in competition, appliance selling in that community will be choked and the interests of the central station will suffer.

W. R. Herstein, Memphis, in his paper on "Electrical Merchandise Distribution," challenged the general complacence over the increased sale of electrical appliances through non-electric stores and argued against the sale of appliances by central stations, in the light of experience.

W. R. Robertson, Buffalo, told the jobbers that the best insurance of prosperity for them is to render such a service that the manufacturer will select the jobber to distribute his goods in preference to any other method. Mr. Robertson announced that 1,100 communities have now been tabulated in the survey which is being made by the jobbers for the Joint Committee for Business Development.

A resolution was passed on the recommendation of the radio committee to petition the government to permit the increase of the wave lengths authorized for commercial broadcasting stations, on account of the interference existing at present. The committee on accounting and statistics was empowered and directed to proceed with a further six months' study of a limited number of the more important commodities for the purpose of developing still more detail on the cost of jobber distribution. A "code of ethics" was unanimously adopted.

Announcement was made that the next quarterly meeting will be held in the week of Feb. 14, the Central Division assembling in Chicago, the Atlantic Division in New York and the executive committee in Atlantic City, N. J.

New York Has a New Electric Taxicab Service

A new type of electric taxicab has just gone into service in New York City, where the Electrotaxi Corporation has placed a fleet of such cars in operation. These are the first electric taxicabs that New York has had since the old electric hansoms of more than twenty years ago. The new taxis are finished in two tones of gray and are in contrast with the color schemes usually employed by public vehicles. The distinctive feature of these new cabs is that they are built with the same stream-line design as gasoline taxicabs, including the hood, underneath which the battery is placed.

FLEET OF ELECTRIC TAXICABS PARKED ON NEW YORK CITY STREET

Alaskan and Other Projects

Power Commission Grants Permits in and Receives Applications from Widely Separated Regions

REVIVAL of interest in Alaskan water-power development was evidenced by the action of the Federal Power Commission at its last meeting in two cases affecting that territory. Two others are pending. For some months interest in this direction has lagged, owing principally to the low prices for wood pulp, the production of which is involved in the proposed developments. The Alaskan-American Paper Corporation of New York, which failed to begin work by Aug. 31, 1922, as required by its license, made satisfactory explanation and gave assurances of proper financial support and was granted two years' additional time by the commission. Approval also was given the application of Maurice D. Leehey of Seattle, Wash., for a preliminary permit to develop power on Beaver Falls and Lake Mahoney, in the Tongars national forest, near Ketchiken, Alaska. A permit was granted last January but not accepted because of the low market for pulp, but the applicant is now anxious to carry forward the development and has proper financial backing.

The commission approved the application of the Empire District Electric Company of Galena, Kan., for a preliminary permit to construct a power dam 175 ft. high in White River, southwestern Missouri. This dam would develop between 40,000 hp. and 80,000 hp. and would increase the capacity at the present Forsyth project and give a regulated flow in the river for 125 miles, with a fall of approximately 350 ft., almost to Batesville, Ark.

The commission approved the application for license of J. M. Freeman of Billings, Mont., for a 45-hp. project on Boulder Creek, in a national forest in Idaho; the application of the Idaho Power Company of Boise for a right-of-way for a transmission line between American Falls and Pocatello; the application of the Emery Consolidated Mining Company of Deer Lodge, Mont., for a license for a transmission line from Deer Lodge to Emery in a national forest in Montana, and the application of O. G. Peterson of Somerset, Ky., for the right to raise an existing dam in Pitman Creek, a tributary of the Cumberland River.

PACIFIC COAST PROJECTS

Application of the Straits Power Company of New York for a preliminary permit to develop 100,000 hp. in northwest Washington was denied on the ground that the same interests are represented in the Sound Power Company, to which recently was granted a preliminary permit for a 90,000-hp. project on Sultan River, and that it is not desirable that further permits be issued until the interests have demonstrated their ability to carry out the Sultan project.

The commission also disapproved the application for a preliminary permit asked by the Northwestern Power & Manufacturing Company of Seattle for a 10,000-hp. project at the outlet of Lake Crescent, in northern Washington. The company has 5,000 hp. on the Elwha River, 25 miles east of the lake. The commission decided that as the Elwha has large power possibilities and Lake Crescent is a summer resort, more power should be developed from the river before turning to the lake.

The application of Harrison Albright and Susie Bemis Albright for water-power development on a number of small streams in southern California was denied as not feasible.

ST. PAUL AND LOUISVILLE CASES

The commission deferred until Dec. 10 action on the conflicting applications of the Northern States Power Company, the city of St. Paul and Markham, Kelsey & Druan for development on the St. Croix River.

The Luce case was set for hearing Dec. 11, and the commission decided that early in January it will hear the issues between the city of Louisville and the Louisville Hydro-Electric Company involving the right to development at the falls of Louisville.

Refunding Activity Continues

DURING the month of November new issues of electric light and power public utility securities were moderate in volume. The total amount of offerings of this type of security equaled $50,328,000, as compared with $91,694,750 during October and $54,900,000 for November, 1921. As is shown in the accompanying table, the number of single issues was small, and the highest offering was the eighteen-million-dollar issue of gold bonds of the Louisville Gas & Electric Company. The most conspicuous feature of the month's financing was the exceedingly low average rate of return yielded the investor, 5.85. Not one 8 per cent issue was floated last month and only a few 7 per cent issues came out. A great proportion of the issues were for refunding outstanding securities, although a large amount of new capital has been obtained to finance plans for the development of properties in response to the increase in load. This condition has been stimulated by the generally prevalent increase in public utility net incomes.

SECURITY ISSUES OF ELECTRIC SERVICE COMPANIES IN NOVEMBER

Name of Company	Amount of Issue	Period	Class of Security	Purpose of Issue	Rate of Interest	Offered at	Per Cent Yield
Janesville Electric Co. (Wis.)	$520,000	One-to-twenty-three-year*	First and refunding mortgage gold bonds of 1915	To reimburse for capital expenditures and for other purposes	5	....	5.80 to 6.00
Louisville Gas & Electric Co. (Ky.)	18,805,000	Thirty-year	First and refunding mortgage gold bonds, series A	Refunding and for construction, working capital, etc.	5	91¼	5.60
	3,500,000	Fifteen-year debenture	Sinking-fund gold bonds, series A	To retire notes and for extensions	6	96½	6.35
New York State Gas & Electric Corp.	650,000	Forty-year	First mortgage gold bonds		5½	97½	5.65
East Penn Electric Co	1,110,000		First preferred stock	To provide funds for new plant and other extensions	7	92½	7.57
Tidewater Power Co. (N. C.)	3,000,000	Twenty-year	First lien and refunding mortgage sinking-fund gold bonds, series A	To retire bonds, acquire additional stock, to increase capital, etc	6	96	6.35
	1,500,000	Fifteen-year	Sinking-fund gold debenture bonds		7	97	7.30
Beloit Water, Gas & Electric Co. (Wis.)	500,000	Fifteen-year	First mortgage sinking-fund gold bonds	To reimburse for expenditures for additions, etc	5	93½	5.65
Commonwealth Edison Co	7,143,000	Twenty-one-year	First mortgage gold bonds of 1908	To redeem notes and to partly reimburse for improvements, etc	5	99	5.07
Niagara, Lockport & Ontario Power Co	2,000,000		Cumulative preferred stock	For acquisition of stock and new construction	7	103½	6.76
Sioux City Gas & Electric Co	3,500,000	Twenty-five-year	First mortgage gold bonds, series A	To acquire property, refund debt and supply capital	6	99½	6.05
Nevada-California Electric Corp.	1,500,000	Twenty-eight-year	First lien gold bonds, series	Refunding	6	98	6.15
Utilities Power Co. (N. H.)	600,000	Twenty-year	First mortgage gold bonds, series A		6	95½	6.38
Dayton Power & Light Co	6,000,000	Nineteen-year	First and refunding mortgage bonds	To retire bonds and for additions	5	93½	5.60
Total	$50,328,000						

*Due $4,000 annually July 1, 1923 to 1944, and $432,000, 1945

Water-Power Projects Under Way in Wisconsin

The hydraulic engineer of the Wisconsin Railroad Commission reports that at present there are four rather large water-power developments in progress in that state. The Wisconsin Public Service Company is building a dam and installing hydro-electric equipment at a plant built some years ago and operated by this company. The Big Falls Power Company is constructing a dam on the Flambeau River near Ladysmith, and hydro-electric equipment will be installed, the power being disposed of largely in the Ironwood-Bessemer district and in Ashland. The Wisconsin-Minnesota Light & Power Company is constructing a reservoir dam on the Chippewa River, where, although it is not intended to install hydro-electric equipment, a large quantity of water will be stored and released during times of low flow, materially benefiting the Cornell Wood Products Company at Cornell, the Wisconsin-Minnesota Light & Power Company at Wissota and the Dolls Paper & Pulp Company at Eau Claire. The Chippewa Power Company is completing a water-power development at Jim Falls, where the dam is already built. This plant, which also will benefit by the Wisconsin-Minnesota company's new dam, will probably market power in St. Paul and Minneapolis.

In addition to the above developments a number of hydro-electric plants are being extensively improved either by increasing the head or by the installation of more efficient machinery and in some cases the reconstruction of the dams. There are more water-power developments in progress in the state this year than during any former year for a considerable period, and it is authoritatively stated that the total amount of developed power in the state will be increased by approximately 10 per cent when the developments that are now under construction are completed.

Patent Office Still Struggles Against Difficulties

Despite enactment by Congress last spring of a bill readjusting salaries upward in the Patent Office and authorizing twenty-nine additional examiners and twenty-two more clerks, the work of the office is no more advanced as regards overtaking the number of pending applications than it was a year ago. This condition is attributed to a steady increase in applications for patents and extensions as well as for the registration of trademarks. The office continues to have difficulty in holding experienced technical men as examiners against the inducements of private employment. While 362 examiners are authorized, approximately a dozen vacancies exist because of inability of the Civil Service Commission to supply qualified men at the salaries offered. It was stated at the Commissioner's office that within forty-nine working days twenty-two examiners submitted resignations.

Up to Nov. 1 32,582 first patents had been issued for the calendar year compared with 37,885 during the twelve months of 1921, which shows a higher rate of issuance this year. None the less, while on Jan. 3 there were 60,244 cases up for action, on Nov. 11 this had increased to 69,845. The greatest activity among applicants has been along chemical and electrical lines.

Mexican Railway Will Electrify 30 Miles of Track

The International General Electric Company has closed a contract for the electrification of 30 miles of track of the Mexican Railway Company, Ltd., between Orizaba and Esperanza, on the main line between Mexico City and Vera Cruz. The section contains many steep grades, and the electrification project calls for the expenditure of between $2,000,000 and $2,500,000. It is predicted that this undertaking will be the first step in the electrification of the whole main line of the railroad, which is the longest in Mexico. The project will be financed through London upon terms agreed upon by officers of the International General Electric and the railroad company.

LINES OF THE MEXICAN RAILWAY WHICH WILL BE PARTLY ELECTRIFIED AT THIS TIME

The compelling reasons for the electrification of this piece of roadway, according to the officers of the International General Electric, were the heavy grades and the increasing traffic. Indefinite postponement of the necessity of double-tracking the road and a saving which will pay for the entire cost of electrification in five or six years are indicated, according to those interested in the development. The system will be operated at 3,000-volt direct current, the power to be supplied at this voltage by the Pueblo Tramway, Light & Power Company, whose hydro-electric plant is about 5 miles from Orizaba.

The Gospel of Publicity Is Preached in Texas

Speaking before a convention of telephone men at Fort Worth, a short time ago, George McQuaid of Dallas, director of the Texas Public Service Information Bureau, made a vigorous plea for publicity, saying:

"The public's welfare depends on the utility being able, through reasonable rates, to maintain unimpaired service and secure new capital to meet the requirements of constantly increasing demands for service. What people desire is most efficient service so long as it is supplied at a reasonable rate. The public stake in a public utility is greater than the general run of people have come to appreciate. There is now a compelling necessity that public utilities relieve regulatory bodies of some of the tremendous pressure falling on them through misapprehension on the part of some of the people of the economic situation. This the utilities may do, educating public opinion to the true condition of the utilities by taking the public fully into their confidence.

"Particularly, the customers of a utility should have every opportunity to understand that nothing is so expensive as poor and unreliable service and nothing so short-sighted on their part as a policy of utility starvation, either through inadequate rates or unjust burdens of irresponsible competition. Utilities should thoroughly understand that they are public servants; that good will and public relations are to be acquired, not alone by good service, but by frankness and an every-day policy of treating the smallest of their patrons with that consideration which is practiced by successful business in non-regulated fields."

Scientific Study of Taxation of Utilities to Be Made

Financed by several of the largest public utility companies in the country, a scientific study of the system of taxation of public utilities in the United States will be made by Dr. Herbert Simpson, professor of economics and political science at the College of Wooster, Wooster, Ohio, working under the auspices of the research institute of the University of Wisconsin. The Milwaukee Light & Traction Company was the leader in this movement and recently appropriated $5,000 for the financing of an exhaustive investigation of the system of taxation as it affects public utility companies. Several other companies added to the fund, which now totals nearly $20,000. The Milwaukee company stipulated that the investigation be made under the auspices of the University of Wisconsin.

The University of Wisconsin is also, according to Prof. Edward Bennett, chairman of the department of electrical engineering, to undertake a detailed investigation of two electrical problems—rural service and inductive co-ordination, a fellowship for that purpose having been founded by gifts from the Wisconsin Utilities Association and the N. E. L. A.

Progress in Carolinas

Group of Power Companies Has Program Involving Expenditure of More than $6,000,000

A CONSTRUCTION and expansion program involving the outlay of more than $6,000,000 has been started by the Carolina Power Company, the Carolina Power & Light Company and affiliated companies, including the Yadkin River Power Company and the Palmetto Power & Light Company, according to officials of the Carolina group. This program includes work now under way, together with extensions to be started in the immediate future, in North and South Carolina, and it is believed that the new power facilities which will be provided will add impetus to the large industrial development taking place in the sections served, which embrace about forty communities in the two states.

Early in the year arrangements were made for the purchase of 27,500 hp. from the Tallassee Power Company at Badin, N. C. This necessitated the construction of a 65-mile transmission line from Badin to Sanford, where the line will tie in with the present transmission system of the Yadkin River Power Company. The new line will be of double-circuit, steel-tower type and will have a capacity of about 75,000 hp. The Carolina Power Company is also constructing a 30,000-kw. substation at Badin and is planning for the immediate construction of a 15,000-kw. steam plant, which it expects to have in service by Sept. 1, 1923. This plant will supplement the hydro-electric plants of the Carolina group during low-water periods. It will be of most modern and efficient design.

The Carolina Power & Light Company has recently purchased the municipally operated plant at Dunn, N. C., and has extended its transmission system to that point. A new 60,000-volt line has been built from Cumberland, N. C., to Hope Mills, N. C., and the company is serving cotton mills there. The construction program of this company also embraces enlargement of 60,000-volt substations at Goldsboro, and Selma, N. C., and other points.

Cotton-Mill Demand Grows

The Yadkin River Power Company now has under way the construction of additions to a 22,000-volt substation at Blewett Falls and a new 22,000-volt transmission line from Blewett Falls into Rockingham, to care for increased power requirements of cotton mills. The company is increasing the capacity of the Laurinburg 100,000-kw. substation by the addition of 7,500 kw., and arrangements are being made for connection with the transmission line being built from Fayetteville to Laurinburg.

The Palmetto Power & Light Company has acquired municipal plants at Dillon and Latta, S. C., and is extending its transmission system from the North Carolina state line through these points to Marion, S. C. The new line will unite other transmission systems now reaching Maxton and Marion and will provide additional power connections for other Palmetto properties. The company is also constructing a 100,000-volt transmission line from De Kalb, S. C., to Camden, S. C., and will install a substation of 3,000 kw. rating at the latter point. Hydro-electric power for both lighting and power purposes will be furnished to the city and industries at Camden.

Consolidation Trend Persists in Indiana

Northern Indiana Power Company Takes Over Seven Properties—Plans of Interstate Public Service Company—Indiana Electric Corporation Ready to Build Seven-Million-Dollar Plant

ANNOUNCEMENT has been made that the properties of the Indiana Railways & Light Company of Kokomo, the Wabash Water & Light Company, the Public Service Company of Rochester, the Noblesville Heat, Light & Power Company, the Sheridan Water, Light & Heat Company, the Logansport Utility Company and the Roann Light & Power Company, all located in north central Indiana cities, have been purchased by the Northern Indiana Power Company. These properties all have been connected by transmission lines and the actual consolidation of the companies will be completed in a short time. The Kokomo company is one of the seven companies previously consolidated as the Indiana Electric Corporation. The commission's action in permitting this consolidation was fought by Kokomo and Indianapolis, and the case is pending in the Indiana Supreme Court.

The consolidation is held to mark a great step in the electrical and industrial development of northern Indiana. The joint operation of the plants will result in economies and efficiencies and will insure all the cities an adequate and dependable supply of electrical energy. In the event of a breakdown of any one of the plants, service may immediately be given from other plants. No change in policies or managements is contemplated, it is said.

The value of the properties which have been purchased is approximately $8,500,000, and the total stocks and bonds to be issued by the new company is approximately the total of the present outstanding stocks and bonds of all the companies. The purchase has been completely financed. It is the intention of the new owners to connect the plants as soon as possible with the superpower plant for which preparations are being made in the coal fields of the Wabash River. The plant is to be of the latest and most modern type and will generate electricity at less cost than any other plant in the state. It is expected that it will be completed about January, 1924. At present the plants located in several of the cities are limited in their growth owing to lack of an adequate supply of condensing water.

The Northern Indiana Power Company is controlled by the Brewer interests, according to L. G. Rothschild, one of the Indianapolis representatives of the interests concerned. A petition for ratification of the action will be presented soon to the Indiana Public Service Commission, which has still to pass upon the consolidation.

Interstate to Absorb Subsidiaries

Preparations are under way for the absorption by the Interstate Public Service Company of its seven subsidiary corporations, said to be worth nearly $6,000,000. The Interstate company will request authority of the Public Service Commission of Indiana for the issuance of $3,100,000 of securities and authority to assume the $2,075,000 of underlying obligations or bonded indebtedness of the subsidiaries. The subsidiary properties to be taken into the Interstate company are the Hydro-Electric Light & Power Company of Connersville, the Hawks Electric Company of Goshen, the Middlebury Electric Company, the Electric Transmission Company of Northern Indiana, the Winona Electric Light & Water Company, the Southern Indiana Power Company and the Indianapolis & Louisville Traction Railway. The Interstate has facilities for developing power from the Tippecanoe and St. Joseph Rivers.

The Middle West Utilities Company, which, with the Interstate company, is owned by the Insull interests of Chicago, now controls the Hawks, Winona, Middlebury, Southern and Electric Transmission companies. The Interstate now controls directly the Hydro-Electric and Indianapolis & Louisville companies. The Electric Transmission Company owns the line connecting the Hawks and Winona properties. The Southern company operates in Lawrence and Monroe Counties. The Indianapolis & Louisville operates the interurban line between Seymour and Sellersburg. No money is to change hands in the deal, but the new Interstate company securities will replace those of the old companies, with the exception of those to be assumed.

Indiana Electric's Plans

Laying of ground plans for the construction of a seven-million-dollar unit of a superpower plant for the Indiana Electric Corporation has been begun on a sixty-three-acre tract on the west bank of the Wabash River, near Terre Haute. Organizers of this corporation are the Brewer interests of Grand Rapids, Mich., controlling the Northern Indiana Power Company, the Merchants' Heat & Light Company, Indianapolis; the Wabash Valley Electric

Company, serving Clinton, Sullivan and other western Indiana cities; the Cayuga Electric Company and the Putnam Electric Company of Greencastle.

Plans call for the installation of two 20,000-kw. units and the installation of three additional units of equal power at a later date, making the ultimate capacity of the plant 100,000 kw.

Adjoining the plant site on the south, west and north are 3,000 acres of coal land, the coal underneath being sufficient to operate the plant to a capacity for thirty years, officials estimate. More than one-half of the water of the Wabash River will be diverted to serve the plant condensers.

Brief News Notes

Lectures on Electric Vehicle Maintenance.—To meet the demand for information regarding electric motor-truck operation and care brought about by the rapidly increasing use of the storage-battery vehicle for city deliveries, the Electric Motor Truck Association of New York City is planning a course of instruction covering every phase of maintenance. These lectures will begin on Friday, Dec. 8, and will be given on the second and fourth Fridays of each month throughout the winter at the Electric Garage, Sixty-second Street and Central Park West.

North Missouri Companies Unite.—The Excelsior Springs (Mo.) Water, Gas & Electric Company has completed negotiations whereby it absorbs the Brookfield Light & Power Company, and the new organization will be known as the North Missouri Power Company. Possession will be given as soon as the Missouri Public Service Commission approves the deal. The new properties acquired by the Excelsior company give service to twenty-two cities in north and northeast Missouri, and this added to the sixteen towns now served by the company makes a total population of 50,000 reached by it.

Government Issues a Novel Publication.—Apparently everything that a commercial traveler ought to know about the twenty republics and the many colonies to the south of the United States, to make a trip profitable as well as enjoyable, is contained within the 734 pages of the revised edition of the "Commercial Travelers' Guide to Latin America," edited by Ernst B. Filsinger and issued by the United States Department of Commerce. Information on steamship lines and railroads, timetables and connections, road routes, hotels and rates, taxes on travelers and restrictions, duties on samples and advertising matter, banks, postal service and postal rates, weights and measures, and all things that may obviate those vexatious delays which are especially troublesome to the uninformed and inexperienced traveler in Latin America, is included, and every city and market of importance in the Latin-American nations is listed, with information as to its characteristics, trade regulations, license fees, routes by which to reach it, etc. More than forty maps based upon the most recent authentic data were specially drawn for use in this publication. The guide may be obtained by applying to the Superintendent of Documents, Government Printing Office, Washington, D. C., or to any of the district or co-operative offices of the Bureau of Foreign and Domestic Commerce.

Progress on Norway (Ind.) Plant.—The new hydro-electric power station of the Hydro-Electric Light & Power Company on the Tippecanoe River at Norway, Ind., is nearing completion. Two complete generators have been received and parts of the four waterwheels are on hand. The transmission line to the site has been built. The plant will have four generating units with a combined capacity of 10,000 hp. All energy produced in this plant will be taken by the Interstate Public Service Company in Indiana and the Central Illinois Public Service Company in Illinois. The property will be operated by the former company.

Wisconsin Commission to Fix New System of Rates for "Loop" Cities.—Eau Claire, Chippewa Falls, Menomonie, La Crosse and thirty-eight other cities and towns receiving electric power from the big seven-million-dollar Wissota dam of the Wisconsin-Minnesota Light & Power Company have been assembling evidence on which a new system of rates will be determined by the Wisconsin Railroad Commission. Preliminary hearings by the commission will be held in Madison some time in December to collect the extensive mass of figures upon which it will base a new schedule of rates for the cities served by its "loop" line, in accordance with the recent finding of the Wisconsin Supreme Court. In this new schedule each community is to be regarded as a unit, and its distance from the source of supply will affect the rates prescribed for it.

Mexican Northern Expanding.—An important expansion of the electric power system of the Mexican Northern Power Company at Boquilla, Mexico, is to take place as rapidly as the construction work can be done, it is authoritatively announced. This is due to a contract which the company has just entered into with the state government of Chihuahua for the building of a power transmission line from its hydro-electric plant to the city of Chihuahua. It is stated that the same line will be extended to the mining camp of Santa Eulalia and that electric power will be furnished for operating the machinery of the mines, ore-reduction mills and various industries of that camp and the capital of the state. The Mexican Northern Power Company, which is a Canadian enterprise, finished its plant while the Mexican revolution was in progress and was in the fighting territory, but its construction was never interfered with.

Associations and Societies

Watt Hour Club.—The New York & Queens Electric Light & Power Company gave its annual dinner to the Watt Hour Club of Queens Borough, New York City, on Nov. 23. The Watt Hour Club, composed of electrical contractors, dealers and jobbers, together with commercial men of the Queens company, is conducted in the interests of co-operation. There were about eighty in attendance. Charles A. Barton, commercial manager of the company; Ray Palmer, its president, and Frank W. Smith, president of the N. E. L. A., spoke.

American Physical Society.—For the meeting of this society in Chicago at the Ryerson Physical Laboratory on Dec. 1 and 2 several papers of interest to electrical scientists were scheduled. Chief among these were the following: "The Torques and Forces Between Short Cylindrical Coils Carrying Undamped Alternating Currents of Radio Frequency," by W. A. Parlin, State University of Iowa; "The Low-Voltage Mercury Arc," by M. Scott, Cornell University; "The Electron Emission from Tungsten, Thorium, Molybdenum and Tantalum," by S. Dushman, H. N. Rowe and C. A. Kidner, General Electric Company; "Characteristics of a Short-Wave Oscillator," by L. L. Nettleton, University of Wisconsin; "The Volt-Ampere Characteristics of Electron Tubes with Thoriated Tungsten Filaments Containing Low-Pressure Inert Gas," by Albert W. Hull and W. F. Winter, General Electric Company, and "The Photoelectrical Properties of Heated Oxides," by H. Kahler, Yale University.

Coming Meetings of Electrical and Other Technical Societies

A complete directory of electrical associations is published in the *Electrical World* in the first issue of each volume. See July 1 issue for latest list.

American Society of Mechanical Engineers—New York, Dec. 4-8.

Electrical Supply Jobbers' Association—Pacific Coast Division, Coronado, Cal., Dec. 7-9; Central Division, Chicago, Feb. 13-14; Eastern Division, Atlantic City, N. J., Feb. 15-16.

New York Electrical Credit Association—New York, Dec. 14. W. J. Kreger, 47 W. 34th St., New York.

American Physical Society—Boston, Dec. 26-30. D. C. Miller, Case School of Applied Science, Cleveland.

National Council Lighting Fixture Manufacturers—Cleveland, Jan. 15-20. C. H. Hofrichter, 231 Gordon Square Bldg., Cleveland.

Lighting Fixture Dealers' Society of America—Cleveland, Jan. 15-20. J. L. Wolf, Electrical League, Hotel Statler, Cleveland.

Western Association of Electrical Inspectors—Chicago, Jan. 23-25. W. S. Boyd, 175 W. Jackson Blvd., Chicago.

Wisconsin State Association of Electragists—Milwaukee, Jan. 24-26.

Association Municipal Electrical Utilities of Ontario—Toronto, Jan. 25-26. S. R. A. Clement, 190 University Ave., Toronto.

American Institute of Electrical Engineers—New York, Feb. 14-16. F. L. Hutchinson, 33 West 39th St., New York.

National Electric Light Association—New York, June 4-8. M. H. Aylesworth, 29 West 39th St., New York.

Recent Court Decisions

Lapsed Franchise Need Not Be Recognized by Commission When Owner Applies for Certificate of Convenience.—In Pirie vs. Colorado Public Utilities Commission the defendant sought to force the commission to issue to him a certificate of convenience and necessity permitting him to supply electric light and power at Idaho Springs because he had conducted such a business there before the war, at which time the transmission line to that place was sold and dismantled. The commission, finding the territory sufficiently served, refused to recognize any right of the defendant to operate there, and in this action the Supreme Court of Colorado acquiesces, finding that the commission had acted within its powers and upsetting various allegations made against the constitutionality of the act creating it. (209 Pac. 640.)*

A High-Voltage Wire Sagging Within 5 Ft. of Ground Constitutes Negligence as a Matter of Law.—A verdict for the plaintiff in Hale vs. Appalachian Power Company, in which suit damages were sought for the death of a farm laborer who either came in contact with a sagging high-voltage line or went so close to it that he received fatal burns, has been affirmed by the Supreme Court of Appeals of Virginia. In this case testimony was that an 88,000-volt transmission wire which had been broken by a sleet storm was temporarily repaired but left sagging at one place within 5 ft. of the ground. This condition, the court held, constituted negligence as a matter of law, and contributory negligence on the part of the victim was for the jury to determine. (113 So. 711.)

Right of Owner of Dam to Manipulate Water a Qualified One.—In Merkel vs. Consumers' Power Company damages awarded by the trial court because of injury to plaintiff's property caused by overflow from the defendant company's hydro-electric development on the Au Sable River have been affirmed by the Supreme Court of Michigan, which made the three decisions that follow: (1) If a release of damages from overflows by reason of a dam was executed in reliance on representations that the payment was made only for land washed away, and not for crop damages, it did not bar a subsequent action to recover for damages to the crops without restoring the money paid; (2) the right of the owner of a dam to manipulate the waters of a river for power purposes alone was not absolute, but qualified by the rights of other riparian owners, and the reasonableness of its acts was not measured alone by the demand for power from its customers; (3) in action for damages to crops from overflows where the evidence fairly tended to show that the work of producing and harvesting the crops had been performed, it could not be said as a matter of law that the expense of production and harvesting should be deducted, and an instruction as to damages was not erroneous for failing to require such deduction. (189 N. W. 997.)

Municipal Bonds to Construct Transmission Line Held Constitutional.—An issue of bonds by a city and the levy of taxes to pay them in order to construct a transmission line to connect with the municipal power plant of another city are for a strictly corporate purpose, according to the Supreme Court of Illinois, and an ordinance authorizing such an issue does not in any manner contravene the national constitution, as alleged by the plaintiff in the case at issue (Carr vs. City of Athens). An injunction was sought to prevent the municipality from issuing bonds for the purpose of constructing a transmission line to connect with the Springfield municipal plant and thus obtaining electric service. In its business relations, the court further decreed, a city is not confined, in purchasing needed supplies, to limits of the city. (136 N. E. 633.)

Apportionment Between Gas and Electric Departments.—In a report filed in the New York Supreme Court by a referee to whom had been referred the case of the Bronx Gas & Electric Company vs. the Public Service Commission, and who found the legal rate of $1 per 1,000 cu.ft. of gas confiscatory, this expression of opinion was contained: "Much testimony was taken in relation to the necessary allocation of certain expense items between the gas and electric departments of the plaintiff's business and the apportionment of the value of certain property used in both departments, but necessary for the plaintiff's gas business. The defendants claimed that the methods used by the plaintiff failed to charge to the electric operation its full proportionate share of the expense or of the value of the property used jointly. On all the evidence, I am convinced that the plaintiff's officers, in distributing these expenses and costs in the manner brought out by the testimony, were actuated by no other motive than an effort to be fair alike to the consumers of the gas department and of the electric department of its business, the latter being at all times subject to regulation by the Public Service Commission, and while doubtless an exact, or nearly exact, distribution could have been made by the introduction of an elaborate system for that purpose alone, its cost, I am certain, would have been more than the saving to either branch, and I doubt even then if the actual percentages would be far from those more or less arbitrarily fixed by the company. No one suggested bases of apportionment less open to criticism. If the case were closer, I would review this phase of it more fully, but I find no reason for disturbing here the actual allocations made."

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Commission Must Not Substitute Its Judgment for That of Town Council on Question of Policy.—The Public Service Commission of West Virginia, granting a permit to the town of Franklin to construct a dam to produce hydro-electric power, although it was alleged that the town could purchase power more advantageously, declared that it had no right to substitute its own judgment for that of the Town Council on this question.

Rates and Density of Service—Uncollectible Bills—Free Service.—In prescribing rates for the Libby Water & Electric Company, the Montana Public Service Commission laid down these among other principles: (1) Patrons of a plant situated in a community where it is not possible to develop that degree of service saturation which insures a dependable and profitable demand may be required to bear higher rates than those in force in more profitable territory. (2) Charges for uncollectible accounts should not be allowed as an item of operating expense unless the accounts are in reason uncollectible, since a public utility must employ more than ordinary diligence to collect the sums due it. (3) The practice of furnishing free service or reduced rates to certain consumers is unlawful, and it makes no difference whether or not the recipient of such service is an employee of the company or the city or county.

Wisconsin Commission Settles Dispute Over Territory.—A settlement of the three-cornered dispute between the Eastern Wisconsin Electric Company, the Calumet Service Company, and the Badger Public Service Company over franchise rights to build light and power extensions to serve the town of Calumet has been effected, the Wisconsin Railroad Commission having granted the Eastern Wisconsin Electric Company, with headquarters in Fond du Lac, sole and exclusive electric service privileges in this township. The law provides an orderly procedure for determining territorial disputes between rival companies, and the commission gave no weight to construction, which it regards as an attempt to obtain advantage during litigation. On the legal points raised the commission found that the Badger Public Service Company had failed to exercise any right it may have had under a permit which it claims to hold, more than one year after its alleged passage by the town board, and that it had no legal right to extend service into the town of Calumet without first obtaining a certificate. On questions of fact the commission found that the town would be better served from the plant of the Eastern Wisconsin Electric Company, to which Calumet had granted a permit.

Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men Engaged in all Branches of the Electrical Industry

C. S. Laudis has resigned his position with the Federal Shipbuilding Company and is now associated with the Pennsylvania Power & Light Company at Hazleton, Pa.

H. C. Miller has severed his connection with the Utah Power & Light Company, Preston, Idaho, and is now associated with the Eastern Oregon Light & Power Company, Baker, Ore.

M. T. Crawford, superintendent of distribution of the Puget Sound Power & Light Company, has recently completed a month's tour of the larger Eastern cities, where he took the opportunity to investigate underground electric systems.

Stuart Wilder now fills the post of electrical engineer for the Bronx Gas & Electric Company of New York City. For some years Mr. Wilder was associated with the Westchester Lighting Company and its affiliated companies in various official capacities.

J. Henry Collins, president and general manager of the New England Electric & Supply Corporation of Lowell, Mass., has recently returned from a four months' trip to Europe, during which he visited France, Germany and Belgium.

J. R. Johnston, treasurer of the Western Electric Company, New York City, recently visited Salt Lake City and attended a luncheon meeting of the advisory committee of the Rocky Mountain Electrical Co-operative League.

L. E. Gettle, a member of the Wisconsin Railroad Commission, has been elected chairman of that body to succeed Carl D. Jackson. Mr. Gettle was appointed to the commission by Governor Blaine in February, 1921, to succeed John S. Allen.

H. C. Sterling became manager of the new organization which was recently formed when the Ohio Power Company of Canton, Ohio, took possession of the light and power properties of the Ohio Electric Railroad Company in Lima. James T. Loftus was made assistant manager.

J. H. McDonell, who was in charge of electrical construction work for the Capital District Engineering Company of Albany, N. Y., with headquarters in Utica, is now in charge of transmission, distribution and trolley system for the Monongahela Power & Railway Company, Fairmont, W. Va.

G. E. Emmons, vice-president of the General Electric Company, has been decorated with the Order of the Rising Sun by the Japanese government, in recognition of services in introducing electrical machinery into Japan and developing the electrical industry. Mr. Emmons recently made a trip to Japan in connection with engineering development work for one of the affiliated concerns of the International General Electric Company.

Dr. von Siemens Celebrates Anniversary

Carl Friedrich von Siemens, the present head of the Siemens & Halske Aktiengesellschaft and the Siemens-Schuckertwerke of Germany, celebrated the fiftieth anniversary of his birth on Sept. 5. Dr. von Siemens is the present head of the illustrious family of Siemens, whose connection

C. F. VON SIEMENS

with the electrical industry dates back to the work of Werner Siemens more than seventy-five years ago. He was educated at the Falk-Realgymnasium in Berlin and later at the technical high schools in Munich and Berlin. Extensive traveling added much to his mental development as well as to his experiences.

His first practical experience was gained in laying a cable between England and Ireland in 1893, and in 1899 he was connected with the Berlin works of the company. From 1901 to 1908 Dr. von Siemens was stationed in London, where he took charge of the plants and business of Siemens Brothers, formerly headed by William Siemens. Returning to Berlin, he was placed in charge of the company's export business and in 1912 he became managing director of the Siemens-Schuckertwerke. From that time on Dr. von Siemens has been the active head of the whole concern, and it was largely due to his supervision and initiative that the business of the company weathered the storm of the after-war troubles and revolutions in Germany so successfully. Like a great many other leading men in industrial life in Germany, Dr. von Siemens has taken an active part in political and social work. He is a member of the Reichstag and of a great number of associations, societies and committees connected with economic and industrial affairs in Germany.

Martin J. Insull, vice-president of the Middle West Utilities Company, Chicago, and Harry Reid, president of the Interstate Public Service Company, Indianapolis, recently inspected the construction work of the Hydro-Electric Light & Power Company, a subsidiary at Connersville, Ind.

Harry G. Cisin, formerly engineering editor of the *Electrical Record* and author of "The Radio Telephone Handbook," has been placed in charge of the publicity and advertising of the Dictograph Products Corporation, New York City. Mr. Cisin was formerly instructor in electrical engineering at Cornell University, Johns Hopkins University, United States Navy Electrical School and the Stevens Institute of Technology.

Robert S. Hale of the Edison Electric Illuminating Company of Boston, chairman of the wiring committee of the National Electric Light Association, has just been elected president of the famous Atlantic Tuna Club. This is a deep-sea-fishing organization, whose headquarters are on Block Island, off the coast of Rhode Island, where the sport of catching the big fish is carried on in much the same way as at Catalina Island on the Pacific Coast.

Joseph B. McCall, president of the Philadelphia Electric Company, received an enthusiastic reception from his employees at a company section meeting of the National Electric Light Association which was held recenly at New Century Hall, Philadelphia. It was Mr. McCall's first appearance since he became ill in the early part of the year.

D. E. Callender, who for some years has been general manager of the Wisconsin Gas & Electric Company, operating the utilities in Racine and Kenosha, has been appointed Racine manager of the Milwaukee Electric Railway & Light Company and on Nov. 1 assumed this position in addition to being general manager and member of the board of directors of the Wisconsin Gas & Electric Company. Mr. Callender's new responsibilities include direction of the operation, distribution, commercial sales and accounting departments of the Racine division of the Milwaukee Electric Railway & Light Company. He entered the public utility business as an accountant with the old Racine Gas Light Company and became manager of that company in 1908. Four years later, when the Wisconsin Gas & Electric Company was organized and it purchased the Racine and Kenosha plants, he was appointed general manager of the corporation. Since that time the company has expanded until it operates electric utilities in fifty cities and villages in southeastern Wisconsin.

George O. Bason has resigned from the employ of the General Electric Company, New York City, and is now local manager of the Poughkeepsie district for the Central Hudson Gas & Electric Company, Poughkeepsie, N. Y.

O. O. Rutledge has been appointed representative of the Puget Sound Power & Light Company at Puyallup and Sumner. Prior to this appointment Mr. Rutledge was in the train service of the Puget Sound Electric Railway for thirteen years.

E. L. Bennett has been appointed sales manager of the Berthold Electrical Manufacturing Company, Chicago. Mr. Bennett was formerly sales manager for the Crystal Washing Machine Company, Detroit, and later sales and advertising manager for the Airway Company, Toledo, Ohio.

Arthur Louis Thexton, who was recently made assistant editor of the *Edison Round Table,* the official publication of the Edison Club of the Commonwealth Edison Company, has been made editor, replacing Ernest S. Butt, who is now in the publicity department of the company. Mr. Thexton was formerly associated with the Chicago *Daily Journal* as reporter and special writer.

George V. W. Ingham has been appointed Eastern sales manager for the electrical division of the Johns-Pratt Company, Hartford, Conn., manufacturer of fuses, protective devices, packing and insulation, and will make his headquarters in the New York City office, 41 East Forty-second Street. Mr. Ingham is well known in the electrical wiring device field, having recently been eastern sales manager of the Bryant Electric Company, with which he was associated for eleven years. Prior to that Mr. Ingham was with Pass & Seymour, Inc., as Western sales agent. His wide acquaintanceship in the electrical industry and his intimate knowledge of the problems of distribution will be of great value in his new connection.

John B. Bassett, who was recently appointed assistant engineer of the New York district of the General Electric Company, has been a member of this company for the past eleven years, with the exception of a short period during the war. Mr. Bassett was graduated from the University of Illinois, where he completed the course in electrical engineering in 1911. From college he entered the testing department of the General Electric Company and was made assistant head of large-apparatus tests. From this post he was transferred to the direct-current engineering department, where he was employed in synchronous-converter design, production and field engineering. In 1918 Mr. Bassett was enrolled at the United States Submarine Base, New London, Conn., where he took the Naval Reserve training course, leading to his assignment as submarine engineer officer. Later he returned to the General Electric Company and joined the engineering department at the New York office to take part in the rapidly developing marine activity. When appointed to his present position he was in charge of Diesel engine electric drive engineering.

F. H. Woodward Made General Sales Manager

Frank H. Woodward, who has been appointed general sales manager of the Great Western Power Company, as was announced in a recent issue of the *Electrical World,* brings to his new office knowledge gained through years of experience in the electrical industry in the West. Mr. Woodward, who is well known to old-time electrical men in San Francisco, served with the Edison Light & Power Company in the years 1894 to 1898 as salesman. After the consolidation of that company with the San Francisco Gas Company as the San Francisco Gas & Electric Company he served until 1902 as superintendent of the contract department. Later he

F. H. WOODWARD

and four others left the service of the company to become factors in the newly organized United Gas & Electric Company of San José, having Santa Clara and San Mateo Counties as their field and assuming the management of the Standard Electric Company of California, with offices in San José, as well. In 1906, following the consolidation of the United Gas & Electric Company with other properties in the Bay region, Mr. Woodward became associated with R. J. Davis and entered the jobbing business in San Francisco. In 1909 he took charge of the commercial department of the Great Western Power Company in San Francisco, and in 1911, when this company took over the City Electric Company of San Francisco, he was made manager of industrial sales. When the Great Western Power Company entered the Oakland field he succeeded to the management of the Alameda and Contra Costa County districts. The reputation he made for himself made him the logical man to succeed James B. Black as general sales manager of the company.

P. T. Davis is now secretary and treasurer of the Juniata Public Service Company, Clearfield, Pa., replacing A. J. Musser.

Obituary

Edward A. Newlon, who until about six months ago was superintendent of the Fremont (Neb.) business of the Fremont Electric Light & Power Company, died recently at David City, Neb. Mr. Newlon was born and educated in Fremont and had become prominent among the younger business men of the city. He went to David City a few months ago to engage in the operation of a theater. He was thirty-five years of age.

Thomas M. Meston, president of the Emerson Electric Manufacturing Company, St. Louis, died suddenly on Nov. 23, of heart disease. Mr. Meston was born in Elgin, Scotland, emigrating at an early age to Canada, where he received his education. In 1886 he moved to St. Louis and entered the employ of the Simmons Hardware Company. He remained with this firm until 1897, when he resigned to become secretary of the Emerson Electric Manufacturing Company. He became second vice-president in 1905 and later succeeded to the presidency of the company.

Frederick Welles Prince, a member of the publicity department of the Western Electric Company, was killed under tragic circumstances while on a business trip in Detroit on Wednesday, Nov. 22. Mr. Prince was spending the evening with friends when a telephone message from a neighbor begged his host and hostess to come to her aid, stating that her husband, from whom she was seeking a divorce, was threatening her. The entire party responded, and soon after they had reached the apartment the husband, who had left it, returned and broke in the door, ordering them to depart. Mr. Prince left at once. He was followed by the husband and a few moments later was found lying unconscious at the foot of the steps leading to the apartment. He died without regaining consciousness. An autopsy was performed and showed that he had been killed by a cerebral hemorrhage, the result of a blow on the jaw. Mr. Prince was well known in the electrical industry. He had been sales manager of the Hartford Light & Power Company, lighting engineer with the Franklin Electric Manufacturing Company, advertising manager of the Westinghouse Lamp Company and had recently joined the organization of the Western Electric Company. He was a man of the highest character, and his genial personality had won a host of friends who held him in much esteem. Mr. Prince was a graduate of Trinity College, where he was a Phi Beta Kappa man. He was forty years old and leaves a widow and one son.

Manufacturing and Markets

Devoted to the Discussion of Business and Economic Problems of the Producer and Distributor, with Market Reports, Trade Activities, Foreign and Construction News

Electrical Apparatus in the Orient*

Opportunities for American Manufacturers—Reflections from a Recent Personal Study of the Market Situation in Japan and China—Labor Conditions in Japan

By S. Glen Vinson
The Ideal Electric & Manufacturing Company, Mansfield, Ohio

THE aftermath of the world war caused in the Orient, as in this country, a period of huge stocks, sudden deflation of values and sharp drops in credit and exchanges. Conditions now, however, are rapidly adjusting themselves to a more sound and economical basis. Business is being resumed, not with a rush or with a boom spirit, but slowly and surely toward a normal, staple, solid footing.

Within the past six months it has been my good fortune to be able to study some of the conditions in the Far East very intimately. Sailing from San Francisco on April 19, I first visited Yokohama, Tokio, Kioto, Kobe and Osaka in Japan and, like any American visiting Japan for the first time, was amazed at the extent of her industries. The city of Osaka particularly is a second Pittsburgh—a busy, hustling, thriving place. In fact, all of Japan appears very well developed from a manufacturing standpoint. There are several very large companies there manufacturing electrical products, for the most part operated and owned entirely by the Japanese. Japan, of course, deserves some credit also for the electrical development of China. There she finds a natural outlet for her products as well as a dependable source of raw materials. Several projects are now under way that will utilize the inland waterfalls for electrical purposes as well as for the electrification of several of her railroads. All in all, I would say that there is a real opportunity for the American manufacturer in Japan, but home competition must be reckoned with very seriously and carefully.

From Japan I crossed to China, where I spent nearly two months and where I truly believe exists a great potential field for American manufacturers of electrical equipment. At the present time only the surface has been scratched. In China the American has one outstanding advantage. All of the Chinese seem to favor both American goods and American methods. China's big drawback always has been politics—an ever-changing directorate that up to now has not had the support of any two sections of the nation. There is a day coming—not too far in the future either—when a big man will take hold and pull all their little parties and cliques together, and then you will see a tremendous era of industrial expansion in China. Right now, even in her unsettled state, China is far from being dead commercially. Shanghai is a hustling commercial city—it has one 40,000-kw. central station, thoroughly modern and efficiently equipped in every way. Iron, textile and flour mills abound and a multitude of smaller plants are to be found. There are iron and steel mills in Hankow, about 600 miles inland on the Yangste River.

English Firmly Intrenched

The English are firmly intrenched here as elsewhere throughout the East, and they are bitter in their commercial prejudices against American firms and American goods. They may accept your account, but it is extremely unlikely that they will sell your goods. There are, of course, many good importing houses and brokers, a number of whom are American, but the real and only successful way to market your product in China is to follow the lead of the Standard Oil Company and the American Tobacco Company and install your own selling organization. This takes money and it takes time, but it will pay big dividends in the end to the firm with courage enough to go into the field aggressively and persistently.

Another condition to be seriously considered in exporting to China is credit, for the Chinese are not good credit risks. Sight drafts with bills of lading attached are very risky. Moreover, Chinamen are accustomed to receive from both English and Germans what to us is almost unbelievable credit. One instance I ran across was of a fifteen-thousand dollar power plant sold by a German firm on nine years' credit, payable $5,000 every three years. But, as I mentioned before, even in the face of this American goods will get the preference if they are rightly introduced, because the Chinese prefer them and also the American way of doing business.

In my tour of China I visited Shanghai, Tientsin, Pekin, Nanking, Hongkong, Canton and many smaller cities. I saw a few American motors, some American fans and a great number of Japanese motors and fans, also a number of English, Italian and German makes.

China has unlimited natural resources virtually untouched. With the exception of the Kailan mining administration organized by Herbert Hoover in north China and since sold to the Belgians, no formidable attempts have been made to mine either coal or metal. The ridiculous part of this is apparent when it is pointed out that China has the greatest potential coal fields known today and yet she imports a large part of the coal she needs for her railroads, mills and steamboats. In the past the Chinese superstitious fear of devils in the ground has prevented them from digging, but in a very short time this will probably pass away under the influence of the white man.

In metal deposits China is rich in copper, lead and zinc and is said by competent authorities to hold the richest iron-ore deposits in the

*From a talk at the Electric Power Club fall meeting, Asheville, N. C., Oct. 30-Nov. 2.

world. A country so vast and so naturally favored as this cannot long withstand the determined efforts that are being put forth and will be put forth to develop it to its fullest extent. The American manufacturer who today recognizes this market and who polishes up his sample kit and gets in there now is going to reap his reward a very few years hence.

LABOR AND COMMERCIAL FACILITIES

Labor conditions in the Orient are interesting. In Japan there are no regulations to speak of concerning child or girl labor, except a government day of eleven hours, which is not at all observed. The average working day will run from fourteen to eighteen hours, and about 60 per cent of all the industrial work is being done by female labor, the other 40 per cent by male labor. These are some of the facts that were brought out at the disarmament conference in Washington, at which it was agreed that by the end of the year 1923 Japan must reach certain standards that were set by the labor committee at the conference.

So far as women and children workers are concerned, Japan is on a lower plane than any other nation represented in this conference. Sixty per cent of her female employees are in the industries, and 80 per cent of these are in the textile mills. There are no laws in Japan demanding inspection of factories and housing conditions. Forty per cent of the girls go home ill annually, and 20 per cent of this number soon die from various causes. These statistics were obtained largely through Mr. Kagawa, who, though a large capitalist, is the principal labor leader of Japan.

In China labor is practically unpaid. In the outlying or rural districts the worker receives hardly enough to buy food. Conditions are better, however, in the manufacturing centers, where laborers are paid what are very good wages for China, though only a small fraction of what we pay here.

The American manufacturer going into China or any part of the Orient, with the exception of Japan, must realize that he is going into a practically undeveloped commercial field without the facilities for distribution, advertising or sales prestige that he would enjoy in his own country. Advertising, of course, can be used, but it must be direct, in the shape of educational literature, as there are practically no mediums, with the exception of our American export papers, that can be used successfully to reach the buyer. Traveling is tedious, difficult and exceedingly slow, the mail service is not what it is here, and unless the company has a full understanding of these facts, it will probably in a very short time become discouraged and withdraw from this field.

I believe that there is a great market looming up for us in the Orient, and I am quite sure that if we tackle it in the thorough manner that has been characteristic of American methods throughout the history of the United States, it will not be many years before this country will have taken the leadership away from the English and our American boats will be carrying American goods in ever-increasing quantities to all the principal ports of the far East. I think, too, that the Shipping Board should extend its service to the Federated Malay States and to India. The present terminus is Hongkong.

The Marsh Patents and the Heating Line

Why the Expiration of the Licenses Will Not Unsettle the Field—Effect of the Entrance of New Manufacturers Into It—The Outlook for Winter Business

BY GEORGE A. HUGHES
President Edison Electric Appliance Company, Chicago

RUMORS have been in circulation that a severe disturbance in the general economics of the heating-appliance industry may follow the expiration of the Marsh patents next February. The chief reason why both manufacturers and jobbers have worried over this matter, it seems to me, is because of the amount of misunderstanding which has grown up around these patents. Back in every human mind there exists an inherent fear of the future and the changes in business and social conditions which may be impending. It is therefore but natural that men in the business of manufacturing, distributing or merchandising heating devices should view with some apprehension any change in an existing system of economic balance. This fear, however, can be dispelled by a study of the actual facts.

At the present time virtually all manufacturers of heating devices are operating under an open, free, competitive market. That is, restrictions affecting trade discounts and competition have been removed from the Hoskins license; and we, as well as other licensees, are using prices based on individual costs.

People think that the prices of electric heating devices have been supported artificially by the Marsh patents. Some think that a flatiron will come down in price $2 when the royalties are no longer paid. But, as a matter of fact, all of the licensed manufacturers pay a royalty of only 6 cents on irons and other socket devices and an average of $1 for every range. That is not enough to affect the price materially. Moreover, the difference in cost between the nickel-chromium heating elements which the "quality" manufacturers will continue to use and the cost of the inferior wire which inexperienced manufacturers may try to substitute will not be great enough to make any marked difference in production costs.

Most of the friction surrounding the early issuance of these patents has been removed, and the business is now one of long standing and so stabilized that the industry is operating along rigid laws of supply and demand. The fundamental problems of manufacturing and distributing are still with us, and so they are with all other manufacturers, and these will and can be solved only by companies with years of experience to their credit. The patent situation has little influence or bearing on these prime issues.

NEW MANUFACTURERS WILL COME

The electrical industry appeals to everybody just as the automobile tire business has been a loadstone to thousands, and there will be overproduction in various lines of electrical manufacture just as there has been overproduction in the tire business. But there is an abnormal element of risk when it comes to electric heating appliances because electricity in the form of heat is a hazard and there is no counting on quality in the product of an inexperienced, inexpert manufacturer. Yet people will

innocently buy these goods if electrical retailers tell them to.

Undoubtedly a considerable number of new manufacturers will spring up when these patents expire, but unless these manufacturers are successful in producing appliances made with an accurate knowledge of cost, I do not see why we need to worry over expansion in this direction. At the present time, as we all know, there are many companies manufacturing a class of equipment that may be called unlicensed, and they are selling such products, but unless these concerns are keeping an accurate account of their costs, I fear that more than one jobber will be disillusioned after a short period of fairly active sales. For most of these houses will have a short life owing to poor cost accounting.

Manufacturers of "quality" products which are well distributed and sold at fair prices need have no qualms regarding the termination of the Marsh patents. Such products sold on a cost basis and a fair profit will always endure. Unless some drop in labor or raw material occurs this fall, I don't see how a reduction in the cost can be made. And the present day tendency is toward rising prices since steel and labor are now about on the level of 1919. There is nothing in the horizon to indicate any lowering of prices on standard goods. Raw-material prices are generally stiffening, and the recent action of the United States Steel Corporation in advancing wages 20 per cent is not without considerable significance.

Although both the railway and the coal strike have been settled, it will necessarily be some time before any saturation in the coal demand can be reached. Therefore, I feel that we shall find a very active sale of heating appliances this winter, especially of the open air heaters. For with a scanty supply of coal on hand people will be more appreciative of an applance which offers instantaneous heat without any dirt or ashes. The few new manufacturers who undoubtedly will spring up to meet this demand cannot create much of a disturbance, and business for the well established firms will be bright. The movement of goods, however, may prove embarrassing, for the demands of the shippers are going to prove more than the railroads can take care of unless the present indications are misleading.

Survey of Business Conditions

Better Industrial Buying Is Helping Control Apparatus

Better buying by the industries and improved business conditions are said by several manufacturers to be responsible for the improvement in control apparatus. A great increase in activity is expected for the next six months on the basis of orders now on hand and inquiries being received. Deliveries are fair.

Commercial Fixtures Helped by Engineering Advice

A large increase in commercial lighting orders is shown by manufacturers' books for the three months just ended. Increased industrial activity and the heavy construction during the summer are given as the primary reasons for this added interest.

Prices are diversified and scattered and few of them seem to bear directly on the amount of demand or supply. One company reports that its lighting engineering department's expense has well paid for itself because of the large amount of orders gained through its advice and activities. Textile mills and the metal industry are showing added interest in proper lighting methods, and although there has been much replacement business, new installations are said to have made up the bulk of the orders. Foreign shipments are fair and increasing.

Say Range Sales Were 85 per Cent Heavier

Range manufacturers are of the opinion that sales during the first ten months of the year have greatly surpassed those for the entire year of 1921, some saying that more than 85 per cent more business was done than last year.

It is stated by one maker that sales vary in different parts of the country. He points out that merchandising by central stations was most important in the work of promotion. Where a spirit of co-operation was not shown by the central stations sales, results were very poor. Another manufacturer again brings up the complaint that there are still a few utilities in the country which are not interested in appliances that cannot be attached to lamp sockets.

Stocks are said to be very much lowered, although manufacturers, jobbers and distributors began this year with quite large amounts.

Farm-Lighting Plants Show Way for Central Stations

Farm-lighting plant salesmen are selling the idea of electrical service for the central-station company by placing small plants in the rural districts, said a manufacturer last week when being interviewed on market conditions for these sets.

This manufacturer pointed out that the installation of these sets generally involves 110-volt wiring in rural homes and farm buildings, and that the standards of insulation adopted often enable service from the local utility to be provided with little additional cost.

Bright Outlook for Storage Battery Sales in 1923

Sales of storage batteries continue brisk and the outlook is bright for the remaining months of 1922 and for the first months of 1923, according to several manufacturers in the Eastern territory. Orders during the last few months have been much higher than those for the corresponding period of 1921. The railroads are buying in greater amounts, and the rapid growth of the electric truck industry is another primary reason for this betterment. Rural sales are said to be in larger volume.

Holiday Business to Be 100 to 175 per Cent of 1921

Holiday buying, according to a survey of leading jobbers, will be from 100 to 175 per cent of last year's business. One distributor states that he will be well satisfied if orders equal those of 1921, and another, voicing the opposite extreme of opinion, says that he is confident business will be almost doubled. However, none of the jobbers thinks sales will fall below the 100 per cent mark.

Vacuum cleaners and washers are the best sellers of the year, with electrical toys running a good second in the market. Sales of flatirons and waffleirons are showing good progress in the Christmas market and are reported by some large retailers and department stores to be from 115 to 125 per cent heavier than for the corresponding weeks of 1921. Percolators in the better makes are showing much activity. It is pointed out by one sales manager in a New York department store that heaters are being sold in large quantities to persons who intend to present them as holiday gifts.

Some congestion in the toy market has been evident, manufacturers claiming that jobbers, fearing a decided slump in novelties, at first failed to order as heavily as was necessary, and when demands from the retailers flowed in, contrary to expectations, placed late orders in a rushed market.

Prices generally are firm, although there has been some slight recession in order to offer attractions in the

larger stores where stocks were bought in larger amounts. This is particularly true in the Eastern market in the selling of certain standard makes of toasters, ironers and vacuum cleaners.

In the Western territory the California Electrical Co-operative Campaign has prepared some excellent display material for the holidays. The tendency is not to rush business there this season, and good orders from dealers are reported. Improved appliances and combination devices are featured. San Francisco jobbers report that some fairly large stocks were carried over by retailers in that city.

Holiday business in Denver is reported rather slow, with some standard lines in demand. One type of toaster has been reduced materially, to $5.95.

Big Increase in Power Apparatus Sales

More than $3,500,000 in Contracts Received by the Westinghouse Company in Last Month—Trend Toward Business Revival Shown

Contracts for power apparatus aggregating more than $3,500,000 have been received during the past month by the power department of the Westinghouse Electric & Manufacturing Company. This total business shows a marked increase in the total sales of previous months and indicates a definite trend toward normal or a revival of business in the electrical industry.

Practically every type of power apparatus is included in the contracts received. Central-station companies have been large contributors to this volume of business. Plans formulated during the period of business depression are now receiving executive sanction as conditions throughout the country indicate a revival of business. New power stations are being erected by a number of public utilities, and extensions are being made by others to take on new loads, both lighting and industrial, that are sure to follow.

The generating capacities of many existing stations have been found inadequate to handle the industrial loads in surrounding communities in many sections of the country, and this condition also has necessitated the construction of new power plants.

The larger part of the record business done recently has been received from customers in this country, but at the same time the activity in the export field has not diminished. Business in Japan particularly continues brisk owing to the further purchase of equipment for a number of power stations that are being built there in connection with the prosposed super-power system in that country centering around Tokyo.

Among the customers from which contracts have been received recently by the Westinghouse company are the Brooklyn Edison Company, Middle West Utilities Company of Illinois, Pennsylvania Central Power Company, Union Electric Light & Power Company, Illinois Power Company, Takata & Company (of Japan), Oklahoma General Power Company, Kansas Electric Power Company, Public Service Company of Northern Illinois, Georgia Railway & Power Company, Idaho Power Company, city of Kansas City, Kansas; Tennessee Electric Power Company, government of the Netherlands, United Gas Improvement Contracting Company, Union Traction Company of Indiana, Phoenix Utility Company, Norfolk & Western Railway, Philadelphia Electric Company, West Penn Power Company, Ohio Public Service Company, Duquesne Light Company and the United Electric Railways Company.

Steady Stream of Instruments Going to Autos and Boards

Demand for electrical instruments continues at a steady rate and there is no indication of a let-up in the near future. The call for instruments for farm-lighting systems is said to be very good at the present time because of improved rural conditions. Moreover, there is much business going to the automobile manufacturers and the switchboard makers.

Schools are not buying very heavily at the present time, but better business is looked for in that direction after the first of the year. Radio manufacturers are said to be well supplied at the present, but there is indication of better opportunities in that market because of the ever-increasing interest in better radio sets by the large army of amateurs.

Says Better Application Is Bringing Motor Orders

In discussing the rapid improvement of the motor market a leading manufacturer of various sizes said recently that the increasing demand was due mostly to a better understanding of application, and that after a period of two years of constant teaching and warning, the average user is now giving better attention to his motor, increasing horsepower when the load is too heavy or decreasing it when the shaft is too light. The result, he pointed out, is the heavy percentages of increased orders on the sales sheets.

Although there is an increased demand for the smaller sizes for use in motor-driven appliances, the medium and larger horsepowers are getting their share of the business. Stocks generally are fair and deliveries improved throughout the United States.

One manufacturing company in Michigan reported in a recent advertisement that its sales have increased 300 per cent over October, 1921, in spite of its price reduction of nearly 40 per cent. According to this firm, more than half of its motor sales have been "repeat" orders to industrial concerns, railroads and manufacturers.

The Metal Market

Some Copper Producers Advance Prices to 14 Cents—Zinc Market Decidedly Softer

Most of the metals have been unusually quiet during the last week, though the prices have been firm with the exception of zinc.

Some copper producers have advanced their quotations from 13⅞ cents to 14 cents, delivered, but not a great deal of copper has been sold at the higher level. The firmer attitude has had the effect of bringing a fair volume of consumption into the market at the 13⅞-cent price, especially as the quoted price was generally 14 cents, and producers gave the impression that at the lower figure a special bargain was being offered. When delivery charges are high there seems to be no disposition to go under 14 cents.

Export demand has been steady, though the volume is not nearly so great as would be the fact if exchanges were more stable. The foreign business has in general netted producers slightly more than has been obtained for domestic deliveries.

Producers in general report November business better than for several months and feel that a 14-cent level will soon be definitely re-established.

The zinc market has become decidedly softer, mainly from lack of support by galvanizers and Europe. Common zinc has been sold even as low as 7.05 cents for November - December shipment. Whereas a week ago sales were chiefly made for forward delivery, which commanded a discount under the spot price, sales during the last week have been largely for prompt shipment. The let-up of European purchases indicates an easier position abroad. However, export trade in zinc was not expected to continue indefinitely, as the sale of zinc by American producers is ordinarily confined to the domestic market. The statistical position of zinc is still excellent, and relief from the fear of a runaway market rather than alarm is expressed by producers. New York prices continue at 35 cents per 100 lb. above those at St. Louis. The price of high-grade zinc remains at 8.25 cents with 30 cents per 100 lb. freight allowance. High-grade zinc business is splendid.

NEW YORK METAL MARKET PRICES

	Nov. 23, 1922 Cents per Pound	Nov. 29, 1922 Cents per Pound
Copper		
Prime Lake	13.75	13.87½
Electrolytic	14.00	14.00
Casting	13.45	13.45
Lead, Am. S. & R. price	7.00	7.00
Antimony	6.50	6.50
Nickel, ingot	36.00	36.00
Zinc, spot	7.25	8.25
Tin, Straits	32.20	32.20
Aluminum, 98 to 99 per cent	21.50	21.50

The Week in Trade

Prices When Quoted Are Those Reported at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

IMPROVEMENT is seen in the majority of the districts, business having been helped by increased buying in the form of holiday orders. The better sellers are vacuum cleaners, flatirons and all kinds of hollow ware. Demand for radio parts has improved, and there is indication of more intelligent buying in that market. Central-station companies and those filling construction orders showed more interest during the past week, according to several leaders in the industry. Prices generally are firm.

New York

Volume of Business Larger — Radio Parts Moving Faster— Wire Active

Volume of business is somewhat larger than two weeks ago, according to several jobbers in the territory. Holiday buying and slightly increased purchasing by the central-station companies have helped the market. Radio parts are moving in greater volume, and some dealers are restocking better grades of apparatus.

Motors.—Increased buying is apparent, the smaller sizes selling best. Stocks are good and prices are shaded in some instances.

Appliances.—Vacuum cleaners and washers are selling in larger volume and are making up the bulk of the holiday business. Toasters are receiving much attention from the gift makers. Other hollow ware is moving on good orders from the dealers.

Wire.—Stocks are in good condition and there are fair amounts going to the building trades. Prices generally are firm.

Chicago

Wire Demand Still Brisk and Prices Advancing—Conduit Supply Low —Lamp Cord Active

Current demand for wiring materials is moving at a steady pace since pleasant fall weather has allowed building construction to keep up somewhat the rate maintained during the summer.

Prices on rubber-covered wire and conduit have risen slightly, but the supply of conduit is still low. Manufacturers of high-tension equipment report another brisk week. Statements of jobbers relative to the Christmas trade indicate that ample stocks have been provided for an active holiday buying season. Most dealers have good stocks of appliances on their shelves and expect that December sales will clean them out.

Conduit.—Local demand is excellent, but stocks are still low. Jobbers report that shipments arrive slowly owing to the freight car shortage.

Flexible Armored Conductor. — No change in call has been noticed, since conductor is selling steadily.

High-Tension Equipment.—Action is still good for all companies. One firm reports that the call for high-tension fuses is tending toward higher voltage and current ratings. Another company is receiving a good volume of 33,000-volt substation equipment. Two 33,000-volt outdoor substations and twelve 13,200-volt farm-line equipment units were sold by one firm.

Safety Switches.—The new type of switch required by a recently passed Chicago ordinance is available since jobbers have received a fair supply from manufacturers. The 30-amp. size is selling the best, although there is some call for the large power sizes.

Lamp Cord. — Most jobbers declare that lamp cord is starting to become active owing to increased holiday buying. Prices remain unchanged.

Atlanta

Holiday Trade Starting—Jobbers Report Farm-Lighting Outfits Active —Telephone Sales Slow

Business continues to improve with the advent of cooler weather, which is responsible for stimulated movement in nearly all lines of retail trade. Building permits continue to pour in with no let-up in sight, thus insuring steady employment throughout the winter if weather conditions will permit construction being carried on. A long-continued drought in the Southeastern States is causing some difficulty to the larger power companies, which have been forced to cut off secondary power consumers. Deliveries are improving and stocks in general are good. Holiday trade in the retail electrical lines is just getting started and dealers are anticipating a good month.

Farm-Lighting Outfits.—Jobbers report the movement as very satisfactory in North Carolina, Florida, and the southern part of Georgia, the boll weevil having upset conditions in north and middle Georgia. The movement gains in volume consistently and the outlook is bright. Stocks are satisfactory and shipments good.

Telephone Equipment. — Sales have slowed up a bit for this period of the year. Good stocks and satisfactory deliveries are reported by all jobbers.

Washing Machines. — This fall witnessed a slight pick-up in this line in the larger communities, though the smaller towns are still averse to the purchase of this specialty in any quantity. Excellent stocks are the rule.

Outlet Boxes. — Continued building activity is responsible for the brisk movement in this line. Good stocks of the standard sizes are on hand, with shipments on all sizes satisfactory. Prices remain steady.

Boston

Wire Prices Firm — Iron Sales Well Maintained—Radio Equipment Buying Increasing

Business improves steadily, but without spectacular features. Prices are firm and stocks appear to be meeting current requirements. Deliveries show some improvement over recent weeks. Appliance sales are rapidly expanding into pre-holiday volume. Building operations contracted for in New England totaled $6,918,900 for the week ended Nov. 21, the best week of this period since 1900. General manufacturing is gaining although the textile industry is a trifle dull. The final collapse of the long-continued strike at Manchester, N. H., was announced on Monday with a vote of strikers to return upon company terms. Central-station business and plant expansion are growing very fast.

Wire.—Prices are firm and sales active in rubber-covered and, to a less degree, in weatherproof. Small sales of bare copper for radio antenna work are under way. House wiring is very active in New England.

Flat Irons. — Sales are well maintained. Recent campaigns for a central-station iron load in territory considered well saturated are yielding more than the quota of business.

Lamps.—A fine volume of business in diversified types and sizes is reported. Portables are moving exceptionally well. Buying for central-station use is vigorous and no reports of shortages are heard.

Radio Equipment.—Popular buying of tube sets is increasing steadily, and in some retail stores stocks are running low on certain parts. The variety of equipment available, however, enables the purchaser to solve most of his problems as far as working apparatus is concerned. The outlook is good for a heavy holiday business in radio supplies.

Pole-Line Material. — More liberal policies as to central-station extensions, combined with a broader acceptance by the public of the pinciples of local financing of unusually expensive extensions, are bringing considerable new business to jobbers. Deliveries are reasonably good, the time lag between many orders and the required date of erection helping the distributor.

Motors.—Slow but positive improvement is apparent in the motor market. Industrial requirements resulting from persistent labor scarcity are beginning to affect the demand somewhat. Com-

petition is very sharp for the volume of business available, and buyers are weighing all factors in credit, delivery, price and service before placing orders.

Heaters.—These devices are entering the staple field, and the policy of selling them with frank statements as to their economic limitations is making for sound business. Extreme economy in domestic coal burning is steadying the sale of heaters in New England. Stocks are at present in excellent shape and the outlook for a well-sustained business is good for weeks to come.

St. Louis

Storage-Battery Sales Much Improved —Conduit Demand Drops—Holiday Buying Not Started

The relatively high price of cotton and slightly better wheat values are exerting a favorable influence upon business conditions. Up to Oct. 28 Illinois, Missouri and Arkansas shipped 6,647 cars of apples, as against only 459 for the entire 1921 season. Cotton ginned in the Southern States to Nov. 14 is about 20 per cent more than at the same time last year. Additional moisture has recently improved the live-stock situation. Retail business is stimulated by colder weather and holiday buying has barely started. Electrical jobbers report declines in business for the week with no apparent explanation. Demand is especially strong for large power equipment. Prices are a little softer.

Radio. — Steady increase in demand obtains, and it is felt that this is not connected with any increase that may result from holiday buying. The buyers' desires are tending toward better grades and more complete equipment. The improved demand is lowering stocks to about their proper level.

Storage Batteries.—Sales are much improved in both radio and automobile lines. Demand is steady in character and is met with ample yet conservative stocks.

Conduit.—Recent shipments temporarily alleviated short stocks, but entirely satisfactory shipments do not yet obtain. Demand dropped somewhat last week.

Holiday Goods.—Dealers' stocks of merchandise are moderate and holiday buying has not appreciably started. They plan on rapid turnovers. Jobbers' stocks are good, being larger than last year as better business is expected. Waffle irons are expected to be good sellers and good orders for all hollow-ware items are coming in. Most prices are firm.

Power Equipment.—Power-plant and transformer substation equipment was very active last week. Large orders were placed and several others are expected to be closed in the immediate future. Competition is keen, but prices are much firmer than six months ago. Deliveries are slow in high-tension switching equipment.

Denver

Nearly All Jobbers Report Gain in Business—Cleaner Sales Spotty —Wire Stocks Excellent

The agreement on the terms of the Colorado River pact, following a court decision upholding the constitutionality of the Moffat tunnel project, together with the recently announced program of unprecedented building activities and municipal improvements, has done much during the past week to give this section of Colorado optimism for a new era of prosperity. Local building permits have fallen off temporarily, but the new program will more than compensate, provided the winter does not prove too rigorous. Nearly all jobbing houses reflect this optimism and report business to be on the gain.

Radio. — Interest is returning and improved trade is reported, with a tendency to cut prices by some retailers because of overstocked condition.

Vacuum Cleaners.—Spotty sales are reported by organizations doing house-to-house selling, the central-station company leading in sales. There is a dearth of unsolicited buyers, according to dealers.

Schedule Material.—A slight drop in discounts from manufacturers is causing an increase to contractors. Ample stocks are reported.

Rubber-Covered Wire.—Advance of 5 per cent now in effect. Local stocks in excellent condition.

Portland–Seattle

Holiday Business Is Active—Rubber-Covered Wire and Flush Switches Advance 10 per Cent

Demand for lumber is again picking up rapidly. Shipments recently showed an appreciable decrease owing to shortage of cars. This condition, however, is being rapidly relieved, and cars for the movement of both lumber and fruit are being received in large numbers. Shipments of fruit by water from ports of the Northwest will far exceed those of a year ago. The foreign commerce of the ports of the Pacific Northwest for 1922 will exceed that of 1921 by at least 30 per cent in volume.

Electrical jobbers report that business conditions continue to give ground for optimism. The volume of business is good and holiday buying is becoming active. Orders of good size are being received, the demand being especially good on percolators, toasters, radiant heaters, lamps and radio equipment. An advance of about 5 per cent is reported on rubber-covered wire. Flush switches have advanced about 10 per cent. Conduit is very active at present. The stock situation is somewhat improved over its condition a month ago, but is still short in some sizes. Country trade generally is active, but the demand for farm-lighting plants is very poor at present. Collections seem to be improving a little, outstanding accounts for the Northwest for the month of October being forty-seven days. Some classes of accounts, however, are in a very precarious condition even at this time.

Appliances. — Ranges are moving very well. This is particularly true of the automatic and super-automatic types. Ironers are very slow, with irons to be had at from $4 to $6. Washers are in good demand.

San Francisco

Range Sales Slower—Improved Broadcasting Helps Radio Sales—Conduit Stocks Still Low

Helped by ideal weather conditions, California building continues to set a record year. Every available craftsman is working. Retail store trade is rather quiet, but many dealers report deposits paid on appliances to be held for Christmas gifts, so that excellent holiday business is predicted. Improved appliance and wiring business from districts badly affected by the 1921 building strike, such as the Mission district, is evidence of restored prosperity. Prospects for 1923 are even brighter.

Ranges.—Sales during the past week have slightly slackened. Never before have such well-trained and experienced selling crews been employed, and, incidentally, never before has such competion among manufacturers been noted, the number of makes now being marketed having nearly tripled.

Radio.—Southern California noted an immediate increase of sales following the installation of improved broadcasting facilities.

Vacuum Cleaners.—The bulk of sales is still being made by crews, but many neighborhood dealers report splendid results through what is termed cold canvassing.

Conduit.—Arrival of a few carloads relieved immediate tension, but jobbers' and dealers' racks are bare of smaller sizes. Architects have changed brands specified so as to obtain immediate service by substitution.

Salt Lake City

Not Much Change in Conditions—Demand for Expensive Radio Shows Falling Off

Not much change in market conditions from the report of a week ago, but many merchants have complained of a slight falling off in demand. It is generally believed that this is due to the fact that taxes must be met within the next few days. Better conditions will probably come with the beginning of the new year. Holiday advertising is already driving home the electrical gift idea.

Demand for expensive radio sets shows a big falling off. One manufacturer has decreased his price about 25 per cent on head sets. The cheaper equipment is found to be more satisfactory with the constant extension of broadcasting stations.

Activities of the Trade

Devoted to News of the
Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

Phelps Electric Company Moves to Larger Quarters

By moving from 163 North Curtis Street to 227 West Randolph Street, Chicago, the Phelps Electric Company has obtained floor space of 5,000 sq.ft. This firm is now manufacturing electric flashers since the patents held by the Solar Electric Company are back again in the Phelps organization. No other changes in the organization were made.

Specialties Manufacturer to Build $200,000 Plant

Homer A. Woods, 19-29 West South Street, Indianapolis, Ind., manufacturer of electrical specialties for automotive service, has completed plans for the construction of a new four-story plant, at Ludlow Avenue and Nevada Street, of brick veneer, 60 ft. x 200 ft., estimated to cost approximately $200,000; of this amount close to $65,000 will be used for machinery.

Mercury Manufacturing Company Tractor Sales Were Doubled

Sales of electric tractors in 1922 by the Mercury Manufacturing Company, Chicago, have doubled those of 1921, according to a statement made by J. R. Beansley, general manager.

On Nov. 22 the total sales for the month more than doubled the sales for the entire month of November, 1921. Mr. Beansley also stated that this volume of business had a wide distribution since equipment was sold to about twenty-five various industries. The material-handling installation for the Southern Railroad Company at Pinners Point, Va., he declared, had increased the material conveyed from 2 tons per man-hour to 9 tons per man-hour.

Hoover Week to be Held Dec. 11 to 16

According to an announcement by the Hoover Suction Sweeper Company, North Canton, Ohio, Dec. 11 to 16 has been designated as the time for "Hoover Week." During the past "Hoover Week" has always had the active support of Hoover dealers, and it is expected that this year's event will bring forth even more enthusiasm and greater results.

A feature will be the window-display contest, which is always earnestly participated in by dealers. To make it even more attractive for the dealer to enter this year's contest the number of major cash prizes has been doubled. In addition there are thirty smaller prizes.

Electrical Engineers' Equipment Increases Production

The Electrical Engineers' Equipment Company, 710 West Madison Street, Chicago, has increased its number of employees 50 per cent by starting a night shift.

R. T. Calloway, sales manager of the company, has said that this move was required because of the excessive demands on its operating capacity for high-tension equipment. He also asserted that most of this material was going to central stations for construction during the winter. With the present freight-car shortage the main problem, according to Mr. Calloway, is one of timely shipments. He expresses optimism for future months.

Sellers of Slate to Meet in New York City, Jan. 25

Manufacturers, producers, distributors, dealers, roofing and other contractors using slate are planning to gather in New York at the Commodore Hotel, Jan. 25 and 26, for the slate industry meetings to be held under the auspices of the National Slate Association. Many of the leading concerns in the industry will hold their own sales meetings with their representatives immediately before or after the dates of the sessions devoted to the problems of the industry. Roofing contractors and other users of slate all over the country have responded well to the need for a co-operative promotion of the use of slate and the betterment of the conditions and relations within the industry which Secretary Hoover urged the progressive concerns of the industry to undertake at the first meetings last year. The results of the first nine months are satisfactory.

Westinghouse Merchandising Department Holds Meeting

THE recently organized merchandising department of the Westinghouse Electric & Manufacturing Company held a meeting recently at French Lick Springs, Ind. The meeting was called by J. S. Tritle, manager of the department, and was attended by the merchandising division managers from all district offices, all the division managers from the factories and the headquarters staff from New York.

The meeting was opened with an address by W. S. Rugg, general sales manager of the company, and continued throughout the entire week, sessions being held every morning and evening, with the afternoons devoted to recreation.

The new Golf Club House was given over to the exclusive use of the visitors for the week and was used for both living quarters and a meeting place.

Back row, left to right: F. L. Nason, H. T. Pritchard, George W. Brown, L. C. Steffan, J. A. Clark, F. D. Koelbel, S. A. Chase, J. S. Tritle, manager; L. L. Gerstenberger, Fuller & Smith; W. S. Rugg, general sales manager; E. W. Knight, B. Lester, George Leake, R. C. Cosgrove, E. L. Andrew. Third row, left to right: B. F. Fuller, R. H. Cook, H. M. Wible, Dr. D. S. Wilson, French Lick Springs Hotel; H. C. Thomas, W. L. Southwell, G. T. Dunklin, W. H. Rolinson, M. C. Turpin. Second row, left to right: W. P. Cochran, George Roosa, J. P. Sprunt, Jr., F. H. Nealis, H. L. Garbutt, J. W. Busch, F. C. Albrecht, E. V. Peterson. First row, left to right: W. G. Balph, F. R. Kohnstamm, H. A. Grace, J. H. Jamison, M. C. Morrow, E. D. Story, J. J. Dorney.

Elliott Company's Thirteenth District Sales Office Opened

The Elliott Company, Pittsburgh, with general sales offices and factory at Jeannette, Pa., manufacturer of power accessories, announces the opening of a new district sales and service office in Baltimore, at 1514 Lexington Building, in charge of J. R. Lemmon, who has been connected with the firm's Philadelphia office.

This makes the thirteenth district sales office for the Elliot company. The products of the associate companies, the Liberty Manufacturing Company, Pittsburgh, and the Lagonda Manufacturing Company, Springfield, Ohio, will also be handled by the Baltimore office.

Western Electric Creates New Installation Department

On account of the rapid growth in the number of telephone switchboards installed the Western Electric Company has delegated this work to a newly created installation department and has placed at its head James L. Kilpatrick, formerly assistant general manager of the Bell Telephone Company of Pennsylvania. Mr. Kilpatrick's headquarters will be in New York City, and he will direct the activities of many thousand men in every part of the United States.

Roller-Smith Company Appoints Electrical Material Firm Agent

The Roller-Smith Company, 233 Broadway, New York City, announces the appointment of the Electric Material Company as its agent in the State of Washington and parts of Oregon and Idaho. The Electric Material Company has recently opened an office in the Hinckley Building, Seattle, and will handle the Roller-Smith Company's lines of electrical instruments, circuit breakers and radio apparatus in that territory. The Seattle office is in charge of R. F. Robinson.

The Wheeler Green Company, Rochester, N. Y., has been appointed a distributor in the Rochester district for Landers, Frary & Clark, New Britain, Conn.

The Electric Storage Battery Company, Philadelphia, has awarded a contract for the initial unit of its proposed Kansas City plant, at Belmont Boulevard and Anderson Street. It will be one-story and basement, to cost about $120,000. It will be ready for the machinery installation at an early date.

The Norwalk Iron Works Company. South Norwalk, Conn., builder of air and gas compressors and refrigerating machinery, announces the opening of a Chicago office at 627 West Washington Boulevard. L. R. Bremser, who for thirteen years was associated with the Gardner Governor Company, will be in charge.

The Mid-City Wire Frame Company, Inc., 1622 Fulton Street, Chicago, recently incorporated with $25,000 capital stock, will manufacture wire lamp shade frames and wire goods to order.

The National Electric Humidifier Company, 4311 East Ravenswood Avenue, Chicago, recently incorporated with $50,000 capital stock, expects to build a plant for complete manufacturing purposes in the near future.

The Gloucester Electric Company, Gloucester, Mass., will issue additional capital stock amounting to $102,620, a portion of the proceeds to be used for extensions and improvements.

The Dominion Insulator & Manufacturing Company, a branch of the Ohio Brass Company, Mansfield, Ohio, has started work on the erection of a plant at Niagara Falls, Ontario, which is expected to be completed by the first of the year. The company will manufacture high-tension porcelain insulators, trolley material, electric car equipment, etc.

The Connecticut Brass Company, Waterbury, Conn., has plans prepared for a new castings factory on Watertown Avenue.

The R. Hardesty Manufacturing Company, Denver, Col., manufacturer of power equipment, has plans for the erection of a new works, estimated to cost $200,000, including machinery. The company recently disposed of a stock issue of $250,000.

The Phoenix Light Company, 525 Market Street, Milwaukee, Wis., manufacturer of electric light fixtures, portable lamps, etc., contemplates enlargement of its works and has issued $125,000 in preferred stock to finance the program, which will be undertaken shortly after Jan. 1. Joseph Sable is president.

The American Lamp-O-Phone Corporation, 442 East One Hundred and Forty-eighth Street, New York City, has been incorporated with a capital stock of $50,000 to manufacture machines and parts. It has taken over a business already established, but is planning to expand into larger quarters immediately. The incorporators are F. Riera, H. H. Stevens and M. H. Elvidge.

The Coppus Engineering & Equipment Company and the New England Brass Foundry Company, Worcester, Mass., are to consolidate under the name of the Coppus Engineering Corporation, capitalized at $500,000. The foundry will be operated as a department of the new company. The board of directors will consist of Frans H. C. Coppus, J. Verner Critchley, Frank A. Drury, Linwood M. Erskine, George A. Gaskill, Jerome R. George and William D. Luey.

The Pyrene Manufacturing Company, 520 Belmont Avenue, Newark, N. J., has moved to this address from its previous location, 17 East Forty-ninth Street, New York City. Its new property provides 100,000 sq.ft. of floor space.

The Cole Storage Battery Company, 2437 Indiana Avenue, Chicago, is taking bids for a one-story addition to its plant, 45 ft. x 100 ft.

The General Refractories Company, Ableman, Wis., has been incorporated in Wisconsin with a capital stock of $120,000 to quarry and mine materials and manufacture firebrick, etc. A large tract of refractory clay and silica has been developed in the heart of the extensive granite and rock deposits surrounding the village of Ableman. The incorporators are W. L. Spraul, B. E. Sloan and J. A. Spraul.

The Allied Belting Company, Greenville, Ohio, will shortly commence the erection of an addition to double its capacity. Considerable new equipment will be installed. The company is considering the installation of looms and other machinery for the weaving of duck which goes into its belts from raw cotton.

The Lexington Battery Company, Lexington, Ky., is planning to rebuild the portion of its factory recently destroyed by fire with loss estimated at $75,000, including equipment.

Dad's Factories, 238 South Meridian Street, Indianapolis, manufacturer of electric lanterns, automobile equipment, etc., has awarded a contract for a four-story-and-basement addition, 60 ft. x 200 ft., to cost $200,000, including equipment. Homer A. Woods is general manager of the firm.

The Gill Battery Company of California, Oakland, Cal., is planning the construction of a new two-story factory, estimated to cost $250,000 with equipment. M. R. Standish is president of the company.

The Trumbull-Vanderpoel Electric Manufacturing Company of Bantam, Conn., maker of electric switchboards, etc., has recently added $50,000 in shares to its capital stock, making a total issue of $300,000.

The Phillips Insulated Wire Company, Pawtucket, R. I., will build a new one-story power house estimated to cost $30,000.

The Walker Vehicle Company, Chicago, manufacturer of electric motor trucks, announces the removal of its New York City office from room 3709, Grand Central Terminal Building, to room 5002 in the same building.

The American Insulation Company, Roberts and Stokley Streets, Philadelphia, manufacturer of electrical asbestos products, has awarded a contract for a new building to cost $25,000.

The Frank H. Stewart Electric Company, Philadelphia jobber, has work under way on a four-story-and-basement addition to its six-story building.

The Hart & Hegeman Manufacturing Company, Hartford, Conn., manufacturer of wiring devices, has purchased a plant at Russ and Lawrence Streets, which has been occupied by the Hartford Auto Parts Corporation, manufacturer of universal joints. Hart & Hegeman bought this property in order to provide quarters for future expansion.

Foreign Trade Notes

PROPOSED UNIFICATION OF LUXEMBURG ELECTRIC SYSTEM.—In a bill now pending before the Chamber of Deputies, according to *Commerce Reports*, the unification of the central-station service of the whole of the Grand Duchy of Luxemburg is being considered. The plan involves the idea of supplying electricity for light and power purposes from one or more central stations, the management to be centralized in a single concern. Four propositions are now being considered by the Luxemburg government, one of which will probably be adopted. The two principal proposals are from steel-manufacturing interests in the Grand Duchy which wish to use waste gas produced from the manufacture of steel for generating electricity. The third proposition is from a Belgian company, which offers to build a steam power plant using coal, and the fourth proposal contemplates utilizing water power from the highlands of the Ardennes. The various cities and towns of the Grand Duchy at the present time are supplied with electricity by independent plants.

FARM-LIGHTING SETS OPERATED BY ELECTRICITY IN CUBA.—American self-contained generating sets which can be operated with alcohol, *Commerce Reports* states, should find an expanding market in Cuba. A group of distillers who are campaigning for the increased use of alcohol as fuel are seeking a wide assortment of American apparatus which can be operated on alcohol and have opened a salesroom for demonstrating and distributing such equipment. The use of alcohol enables a generator set to be operated in localities where current and gasoline are unobtainable.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

An agency is desired in Cuba (No. 4,427) for wire cables, steel products, etc.

An agency is desired in Australia (No. 4,432) for electric labor-saving devices, fractional-horsepower electric motors, electric lamp shades and fittings, wireless sets and appliances, etc.

An agency from manufacturers is desired in Peru (No. 4,439) by a representative in the United States for electrical supplies, such as lamp cord, fixtures, glassware, electric globes, motor appliances, heater appliances, insulators, dry and wet batteries and specialties.

An agency is desired in Norway (No. 4,496) for all kinds of electrical supplies for power stations.

ELECTRIC EQUIPMENT FOR WAIRARAPA (NEW ZEALAND) POWER PROJECT.—Bids will be received by the Wairarapa Power Board, New Zealand, until Dec. 20, for a 3,000-volt switchboard, lightning arresters, disconnecting switches and choke coils for 11,000-volt and 3,000-volt three-phase circuits.

New Apparatus and Publications

INSULATING VARNISHES AND COMPOUNDS.—The Sterling Varnish Company, Pittsburgh, Pa., is distributing a forty-eight-page catalog covering the "Sterling" insulating varnishes and compounds.

SWITCHES.—Harvey Hubbell, Inc., Bridgeport, Conn., is distributing a leaflet (superseding pages 74-75, catalog No. 17), covering the change in the design of the Hubbell "De Luxe" toggle flush switches.

PRECISION INSTRUMENT.—The Olsson Corporation, 7-9 Hanover Street, New York City, has developed a new type CO_2 indicator, known as the "Olsson Gas Balance."

RADIO-TELEPHONE RECEIVERS.—The Roller-Smith Company, 233 Broadway, New York City, is distributing bulletin No. 20, covering its "Universal" radio-telephone receivers and loud speakers.

TABLE-TAP.—Bulletin No. 17-19, distributed by Harvey Hubbell, Inc., Bridgeport, Conn., describes the Hubbell "Triplex" table tap.

AIR COMPRESSORS.—The Ingersoll-Rand Company, 11 Broadway, New York City, has recently developed a new line of small vertical belt-driven air compressors, known as type 15.

ELECTRIC SIGN.—The Shelton Electric Company, 16 East Forty-second Street, New York City, has recently developed a new electric sign, known as "Shelton Script," which can be used on direct current and alternating current without changes.

ELECTRIC MOTORS.—The Fuerst-Friedman Company, electrical power engineers, 1,251 West Third Street, Cleveland, has issued bulletin No. 25, containing description and price list of new and rebuilt motors, generators, etc., carried by the company.

OIL BURNER.—The Hauck Manufacturing Company, 129 Tenth Street, Brooklyn, N. Y., has recently developed a new "Hauck" Venturi type of oil burner.

PORTABLE ELECTRIC TOOLS.—Catalog No. 5 issued by the Black & Decker Manufacturing Company, Towson Heights, Baltimore, covers its portable electric tools and shop equipment.

New Incorporations

THE BRIGHT LIGHT & POWER COMPANY, Sanford, Fla., has been incorporated with a capital stock of $100,000 by K. McIver, I. E. McIver and L. P. Campbell.

THE FISHING CREEK POWER COMPANY, Newark, N. J., has been chartered by L. J. Relyea, S. W. Myatt and J. E. Ammann, Newark. The company is capitalized at $3,500,000 and proposes to deal in electricity.

THE CITIZENS' LIGHT & POWER COMPANY, El Dorado, Ark., has been incorporated with a capital stock of $100,000 by E. L. Pye, N. C. Marsh, T. H. Norris and others. The company proposes to distribute electricity and water in El Dorado.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

MADISON, ME.—The Great Northern Paper Company has started work on the construction of a new hydro-electric plant in Madison to develop 4,000 hp.

WINDHAM, ME.—The power rights of the Windham Manufacturing Company on the Presumpscot River have been leased by the Mallison Falls Power Company. The latter company proposes to erect a new power plant of 1,000 kw. capacity, to cost about $100,000. Electricity generated at the plant will be disposed of in Windham, Gorham and Westbrook.

MEREDITH, N. H.—The Utilities Power Company has issued $600,000 in bonds, the proceeds to be used for the construction of the first unit of a hydro-electric power plant at Ayer's Island, Bristol, with capacity of 7,500 hp., transmission lines and substations. The plans provide for an ultimate capacity of 35,000 hp. Jackson & Moreland, 387 Washington Street, Boston, are engineers.

BOSTON, MASS.—Preliminary plans have been prepared by the Boston Elevated Railway Company for the construction of an underground station in the Cambridge-Dorchester tunnel at Cambridge and Charles Streets, to cost about $600,000.

CAMBRIDGE, MASS.—The Ford Motor Company, Detroit, will build a power house in connection with its proposed local assembling plant, to cost about $300,000.

SPRINGFIELD, MASS.—Preliminary plans are under way for a new technical high school, with vocational departments, adjoining a present school on State Street, to cost about $800,000. E. C. and G. C. Gardner, 33 Lyman Street, are architects.

VINEYARD HAVEN, MASS.—Extensions and improvements are being made to the local plant of the Cape & Falmouth Electric Company, including an addition to power station, installation of a 425-hp. engine with generator, new condensers and pumps. The distribution lines are also to be changed from single-phase to three-phase.

Middle Atlantic States

BROOKLYN, N. Y.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Dec. 12, for seventy-five pressure switches for the South Navy Yard (Schedule 316).

BUFFALO, N. Y.—Electric power equipment will be installed in the proposed new flour mill to be erected by the Island Warehouse Company, Ganson Street, to cost about $500,000.

DUNKIRK, N. Y.—Electric power equipment will be installed by the Atlas Crucible Steel Corporation in connection with extensions to its local plant, and also branch works at Charleroi, Pa., to cost about $250,000.

ITHACA, N. Y.—The New York Gas & Electric Corporation is considering an issue of $650,000 in bonds, the proceeds to be used for extensions and improvements.

NEW YORK, N. Y.—The New York Edison Company will make extensions and improvements to its substation at 33-43 Gold Street, to cost $100,000.

NEW YORK, N. Y.—Electric power equipment will be installed in the proposed ice-manufacturing plant to be erected by the Huntoon Ice Company, 631 Hudson Street, on West Nineteenth Street, near Tenth Avenue.

NORTH TONAWANDA, N. Y.—The Tonawanda Power Company is planning to build a power plant on Webster Street, to cost about $150,000.

PERTH AMBOY, N. J.—The Public Service Electric Company is reported to be negotiating for the purchase of the local municipal electric plant, to be merged with its system in the Raritan River district.

TRENTON, N. J.—The Public Service Electric Company plans to erect a transmission line from Burlington to Trenton. When completed the Chauncey Street power plant will be discontinued and service supplied from the Burlington plant which will be enlarged.

WEST BERLIN, N. J.—Baccellieri Brothers, 924-26 South Eleventh Street, Philadelphia, will construct a power house in connection with their proposed local furniture manufacturing plant.

ALLENTOWN, PA.—The Masonic Temple Association, 21 North Seventh Street, will build a power house in connection with its proposed masonic temple at Linden and Fulton Streets, to cost about $500,000. R. G. Schmidt Company, 154 West Randolph Street, Chicago, is engineer.

BANGOR, PA.—A new street-lighting system will be installed on Broadway. The Pennsylvania Utilities Company will furnish the service.

BRISTOL, PA.—The Megargee Paper Mills, Modena, will build a power house in connection with their proposed new local plant, to cost about $250,000.

CORAOPOLIS, PA.—Plans for the proposed manufacturing plant to be erected by the Russell, Burdsall & Ward Bolt & Nut Company, Port Chester, N. Y., in Coraopolis include a power plant. The cost is estimated at $1,000,000. George Mertz, Port Chester, is engineer.

LANCASTER, PA.—The Berkshire Electric Company, which operates substations at Sinking Springs, Wernersville and Womelsdorf, has issued $59,000 in bonds for extensions and improvements.

PHILADELPHIA, PA.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Dec. 5, for 450 storage batteries for aircraft service at the local aircraft factory. (Schedule 312.)

PHILADELPHIA, PA.—A power house will be built in connection with the seventeen-story addition to the Jefferson Hospital to be erected at Clifton and Sansom Streets, at a cost of about $1,400,000.

PHILADELPHIA, PA.—The Baldwin Locomotive Works, North Broad Street, will replace the present steam-operated machinery with electrically-driven machinery. Installations will also be made at its proposed new plant at Eddystone, to cost about $2,000,000.

SHARON, PA.—The Shenango Valley Electric Light Company contemplates ex-

tending its transmission lines from Sharon to Orangeville, Ohio, a distance of 6 miles, to furnish electrical service in the latter town.

SMETHPORT, PA.—The Keystone Power Company will operate a local electric light and power service.

HAGERSTOWN, MD.—The Board of Commissioners has rejected the proposal of the Potomac Public Service Company for local service and has authorized plans prepared at once for the proposed municipal electric plant, for which $300,000 is available.

NORFOLK, VA.—The Nansemond Public Utilities Corporation, recently organized, plans for the construction of a transmission and distributing system in a section of Nansemond County. E. L. Myers is president.

WASHINGTON, D. C.—The Commissioners of the District of Columbia have decided to adopt new system of street lighting. The first installations will probably be made within a few months.

WASHINGTON, D. C.—Bids will be received by the Purchasing Agent, Government Printing Office, until Dec. 6, for electric and gas neutralizer equipment for department use.

WASHINGTON, D. C.—Bids will be received by the Chief Signal Officer, United States Army, until Dec. 8, for miscellaneous telephone equipment, as per schedule (PR 1D1566—6CP).

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, until Dec. 12, for one armature coil winder for Hampton Roads, Va., and two armature coil winders for San Diego, Cal.; also for one motor-driven taping machine for Hampton Roads and two motor-driven taping machines for San Diego (Schedule 310); also for twenty portable electric drills and nine electric grinders for the Mare Island Navy Yard (Schedule 295).

North Central States

DETROIT, MICH.—The Detroit Edison Company will build a two-story substation on Visger Street, to cost about $125,000.

DETROIT, MICH.—The Detroit Lubricator Company, Trumbull Street, will build a power house at its plant, to cost $26,000.

EVART, MICH.—The Board of Education will build a one-story power house at the new local grade school, to cost about $135,000.

MONROE, MICH.—Bids will be received by F. M. Kressbach, city clerk, until Dec. 11, for furnishing and installing equipment in the city waterworks as follows: One 3,000,000-gal. (daily) steam pumping engine; one steam turbine-driven electric generator; two 150-hp. water-tube boilers, two boiler-feed pumps, one feed-water heater; two 1,000,000-gal. (daily) motor-driven centrifugal pumps, one 2,000,000-gal. (daily) centrifugal pump; one sump pump, two coal trucks, switchboard, etc. Hoad, Decker, Shoecraft & Drury, Ann Arbor, are consulting engineers.

PETOSKEY, MICH.—Preliminary plans are being prepared by the Petoskey Portland Cement Company for extensions to power house, factory and stock house, to cost about $500,000. J. C. Buckley, First National Bank Building, Chicago, is engineer.

CINCINNATI, OHIO—The Cincinnati, Newport & Covington Railway Company has issued $4,000,000 in bonds, part of the proceeds to be used for extensions and improvements.

CLEVELAND, OHIO.—Plans are under consideration by the City Council for the installation of ornamental lighting systems on St. Clair Avenue, to cost $50,000; East 150th Street, $23,000; Superior Avenue, $48,600; East 105th Street, $51,000; Euclid Avenue, and East 105th Street, $44,000, and Lorain Avenue, $89,600. G. Beck with, City Hall, is engineer.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, Cleveland, until Dec. 8 for distribution transformers for the division of light and power. Bids will also be received on the same date for power limiting reactors.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until Dec. 6 for furnishing, lighting, extinguishing, repairing, maintaining and furnishing energy for electric clamps in the city of Cleveland.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, Cleveland, until Dec. 8 for an electric traveling crane, switchboard and switchboard wiring and electric valve controls for the Fairmount pumping station, division of water.

MARION, OHIO.—A service company has been organized by farmers of Marion, Morrow, Crawford, Union and Wyandot Counties to erect a high-tension transmission line to supply electricity to farms in that section. Energy will be supplied by the Columbus, Delaware & Marion Electric Company.

LOUISVILLE, KY.—The Mengel Body Company, recently organized by officials of the Mengel Box Company, will build a power house in connection with its proposed new automobile body plant, to cost about $500,000.

ANDERSON, IND.—The Union Traction Company will build an addition to its local power plant to cost about $200,000, including equipment.

GARY, IND.—The Calumet Electric Company has acquired the property of the Wanatah-Lacrosse Electric Company. Extensions and improvements will be made and the plant merged with the Calumet system.

KOKOMO, IND.—The Northern Indiana Power Company, recently organized with a capital of $3,500,000, has made application for permission to purchase the following properties: Indiana Railways & Light Company, Kokomo; Noblesville Heat, Light & Power Company; United Public Service Company, Rochester; Wabash Water & Light Company; Roan Light & Power Company; Logansport Utilities Company, and the Sheridan Water, Light & Heat Company. The systems will be connected, new transmission lines erected and extensions and improvements made.

SHELBYVILLE, ILL.—Bonds to the amount of $100,000 have been voted for a new municipal electric light plant and distribution system.

MENASHA, WIS.—The City Council will install automatic electrically driven sewage-pumping equipment. Two 20-hp. motors, an automatic-control panel, air compressors and connections will be required. J. H. Kuester is superintendent of the municipal electric light and water department.

SHOREWOOD, WIS.—Bonds to the amount of $75,000 have been voted for changing the street-lighting system from gas to electricity. Shorewood has not a post office.

HANNIBAL, MO.—The Hannibal Railway & Electric Company is planning to issue $150,000 in bonds, part of the proceeds to be used for extensions and improvements.

MAYSVILLE, MO.—The De Kalb County Electric Company contemplate building a new power plant, to cost about $80,000.

ST. LOUIS, MO.—The Ford Motor Company, Detroit, will build a power house in connection with its proposed new assembling plant in this section, to cost about $2,500,000.

Southern States

MURPHY, N. C.—The Carolina-Tennessee Power Company has preliminary plans under way for a hydro-electric generating plant, with capacity of 60,000 hp., and transmission system, estimated to cost about $5,000,000.

STATESVILLE, N. C.—The Southern Power Company, Charlotte, plans to extend its transmission lines from Lookout Shoals to Winston-Salem, Greensboro and High Point, and also to erect a switching station near Greensboro, to cost about $1,000,000. W. S. Lee, 433 East Morehead Street, Charlotte, is engineer.

RIDGEWAY, S. C.—Bids will be received by the city of Ridgeway for the construction of an electrical distribution system, 13,200-volt transmission line from Ridgeway to Winnsboro with substations; water distribution system and sanitary sewer system, to cost from $50,000 to $60,000. The Ryan Engineering Company, Arcade Building, Columbia, is engineer.

OCALA, FLA.—The installation of new equipment, including a generator, engine, etc., is under consideration by the Marion County Ice Company.

CHATTANOOGA, TENN.—The Tennessee Power Company is planning to build a 15,000-hp. steam auxiliary plant in 1923 to supplement its hydro-electric units, to cost about $1,500,000. Plans are also under consideration to construct another power dam on the Oconee River, which would add another 20,000 hp. to the system, and also to raise the present dam at Rock Island, increasing its output by 12,000 hp. Arrangements are also being made to connect its system with that of the Georgia Railway & Power Company, Atlanta, Ga.

HAZLEHURST, MISS.—Preliminary plans are under way for the installation of an ornamental lighting system on West Railroad and Estelle Avenues.

WASHINGTON, ARK.—The local electric light plant has been acquired by the City Council to be operated by the municipality. Extensions and improvements will be made, including new distributing lines.

LAFAYETTE, LA.—Bids will be received by the city of Lafayette at the office of the Trustee of Finances until Dec. 4 for improvements to the electric and water plant. The equipment will include generators, water tube boilers, engines, switchboard, condenser, pumps, etc. The J. B. McCrary Company, Atlanta, Ga., and Lafayette, is engineer.

ATOKA, OKLA. — The Public Service Company plans to extend its transmission system from Wapanucka to Bromide and vicinity.

OKLAHOMA CITY, OKLA.—The Kenyon Brick & Tile Company, 2,700 West Tenth Street, will install electric power equipment in connection with proposed extensions to its plant.

AUSTIN, TEX.—A power plant will be installed in the eleven-story hotel to be erected in Austin by the Baker Hotel Corporation, San Antonio, to cost about $900,000.

CHILDRESS, TEX—The Texas Central Power Company contemplates erecting a transmission line from here to Clarendon, to cost about $100,000.

DALLAS, TEX.—Plans are under consideration for the installation of an ornamental lighting system in Oak Cliff, to cost about $25,000. G. D. Fairtrace is city engineer.

MARBLE FALLS, TEX.—G. L. Jones, owner of the local electric plant contemplates extensions and improvements, including the installation of additional equipment. New distributing lines will be built.

ROBY, TEX.—The Abilene (Tex.) Light & Power Company has acquired the properties of the Roby (Tex.) Light Company, and the Rotan (Tex.) Light Company. New substations will be erected and extensions made to the systems.

TERRELL, TEX.—Additions will be made to the municipal electric power plant, including the installation of new equipment.

Pacific and Mountain States

SPOKANE, WASH.—The Veneer Products Company, Seventeenth and Dock Streets, contemplates extensions to its power plant and mill increasing the output of the mill from 50 to 250 tons. The cost is estimated at about $250,000.

TACOMA, WASH.—Permission has been granted by the state for the construction of a municipal hydro-electric power plant on the Skokomish River, with storage reservoir of 190,000 acre-ft. capacity. The plant will have an output of 75,000 hp. and will cost about $5,000,000 complete.

OREGON CITY, Ore.—The Hawley Pulp & Paper Company plans an addition to its power house in connection with plant extensions, to cost about $1,500,000.

TILLAMOOK, ORE.—The Coast Power Company is preparing plans for a new power plant, to cost about $1,000,000.

LIVERMORE, CAL.—Bids will be received by C. R. Forbes, director of the United States Veterans' Bureau, Arlington Building, Washington, D. C., until Dec. 18, for electrical work in connection with the construction of twenty-nine buildings at the United States Veterans' Hospital at Livermore, also for refrigerating machinery and laundry equipment. Drawings and specifications may be obtained upon application to the office of Matthew O'Brien, architect, 68 Post Street, San Francisco.

LOS ANGELES, CAL.—The Union Pacific Railroad Company, Chicago, will build a substation in connection with its proposed new shops here, to cost about $1,500,000.

LOS ANGELES, CAL.—The Council has adopted ordinances for the installation of ornamental lighting systems on Eighth Street and Western Avenue.

MANTECA, CAL.—The South San Joaquin Irrigation District has applied to the State Water Commission for permission to construct a hydro-electric plant on the

Stanislaus River, with capacity of 7,550 hp., to cost about $300,000.

SAN FRANCISCO, CAL. — Plans are being perfected for additional street lamps on Geary Street, Twenty-first to Twenty-eighth Avenue.

CASA GRANDE, ARIZ.—Plans are being prepared by the Casa Grande Valley Electrical District for the erection of 25 miles of 45,000-volt transmission line, 90 miles of 11,000-volt transmission line and about 100 miles of laterals, and a substation, to cost about $200,000. S. J. Norman, Casa Grande, is engineer.

Canada

VANCOUVER, B. C.—In addition to improvements to its power plant on the Stave River the British Columbia Electric Railway Company is planning to build a new power plant further down the river, to develop 100,000 hp. The cost is estimated at $10,000,000.

PORT BURWELL, ONT.—The erection of a 13,000-volt transmission line from Tilsonburg to Port Burwell and the installation of a local distribution system, to cost about $60,000, is under consideration by the Council.

PORT COLBORNE, ONT.—The Port Colborne Hydro-Electric Commission has requested the Town Council to pass a by-law authorizing an appropriation of $14,000 for improvements to the local electric service.

QUEENSVILLE, ONT. — The Village Council is negotiating with the Council of Newmarket to furnish electricity in Queensville.

ST. CATHARINES, ONT.—The Niagara, St. Catharines & Toronto Electric Railway Company contemplates extending its railway to Bridgeburg, a distance of 18 miles.

DRUMMONDVILLE, QUE.—Preliminary plans are being prepared by the Southern Canada Power Company, 330 Coristine Building, Montreal, for the construction of a dam and power house, to cost about $700,000. J. H. Trimingham is chief engineer.

RICHMOND, QUE.—Plans are under consideration for the erection of a transmission line from Drummondville to Richmond, to cost about $75,000, next summer, in connection with the franchise of the Southern Canada Power Company to furnish electricity for lighting here.

Electrical Patents

Announced by U. S. Patent Office

(Issued Nov. 7, 1922)

1,434,363. SYSTEM OF ELECTRICAL DISTRIBUTION; W. L. Bliss, Niagara Falls, N. Y. App. filed Nov. 15, 1915. Chattering of automatic cut-out avoided on variable-speed generators.

1,434,365. GENERATOR REGULATOR; A. F. Brotz, Kohler, Wis. App. filed April 21, 1921. For variable-speed generator.

1,434,374. ELECTRIC RESISTANCE WELDING MECHANISM; M. De Lemon and A. Malec, Chicago, Ill. App. filed Jan. 20, 1920. Welding overlapping surfaces of sheet metal at several points simultaneously.

1,434,395. ELECTRIC FURNACE; W. Meinersmann, Elizabeth, N. J. App. filed Jan. 30, 1920. Electrodes formed from scrap metal.

1,434,451. PROCESS FOR THE MANUFACTURE OF CARBIDE; A. E. Reid, Readsboro, Vt. App. filed Oct. 23, 1920. Within an electric furnace.

1,434,469. DEPOLARIZER FOR DRY CELLS; A. V. Wilker, Berea, Ohio. App. filed Dec. 28, 1918. Activating agent of yellow mercuric oxide.

1,434,472. HEATER FOR BOTTLES AND THE LIKE; C. Anselm, New York, N. Y. App. filed Oct. 4, 1919. Electric element inserted into receptacle.

1,434,518. TELEPHONE-EXCHANGE SYSTEM; R. S. Bailey, Montclair, N. J. App. filed March 22, 1921. Interconnection between manual and automatic exchanges.

1,434,548. ELECTROLYTIC GAS GENERATOR; I. H. Levin, New York, N. Y. App. filed May 22, 1917. Produces hydrogen and oxygen.

1,434,555. WAVE FILTER; W. H. Martin, New York, N. Y. App. filed April 26, 1920. Transmits frequencies between preassigned limits only.

1,434,565. SUPPORTING MECHANISM FOR INSULATORS; E. O. Sessions, Chicago, Ill. App. filed Feb. 25, 1918. Prongs on base clamp porcelain securely.

1,434,588. REINFORCED PRIMARY FOR STARTING OR IGNITION SYSTEMS; C. P. Brockway, Toledo, Ohio. App. filed Dec. 6, 1920.

1,434,633. THERMOSTAT AND THERMOSTATIC CONTROL DEVICE; E. J. Rohne, Minneapolis, Minn. App. filed June 10, 1920. For electric irons.

1,434,640. DEVICE FOR CLEANING MOTORS; G. Wencker, St. Louis, Mo. App. filed July 19, 1920. Clean air constantly forced through motor by fan.

1,434,671. SYSTEM OF ELECTRIC SHIP PROPULSION; W. J. Belsey, Helensburgh, England. App. filed July 29, 1920. Some of auxiliaries driven by current from main generator.

1,434,685. IGNITION MECHANISM FOR GAS ENGINES; W. L. Diffendorf, San Diego, Calif. App. filed July 14, 1920.

1,434,689. MOTOR CONTROL; J. Eaton, Schenectady, N. Y. App. filed Dec. 26, 1919. For motors driving planers, etc.

1,434,693. TREATMENT OF ZINCIFEROUS ORES OR CONCENTRATES; J. H. Gillies, East Camberwell, Victoria, and P. McP. Gillies, Electrona, Northwest Bay, Tasmania, Australia. App. filed Jan. 28, 1919. Zinc recovered by electrolysis.

1,434,707. RADIO RECEIVING SYSTEM; E. W. Kellogg, Schenectady, N. Y. App. filed April 21, 1921. Widely separated receiving antennas connected by lines to central receiving station.

1,434,727. SYSTEM OF ELECTRIC LIGHTING; J. H. Allen, Chicago, Ill. App. filed April 12, 1921. Ornamental street-lighting units with two sizes of bulbs.

1,434,728. PROTECTING MEANS FOR ELECTRICAL SYSTEMS; M. Arendt, C. W. Burrows and H. Rosenmeyer, New York, N. Y. App. filed July 31, 1920. Automobile generator and storage-battery system.

1,434,755. ALTERNATING-CURRENT COMMUTATOR MOTOR; C. W. Shaifer, Schenectady, N. Y. App. filed May 24, 1920. Control of pilot motors operating rheostat, valves, etc.

1,434,758. SYSTEM AND APPARATUS FOR MOTOR CONTROL; J. F. Tritle, Schenectady, N. Y. App. filed Jan. 24, 1921. Pilot motor gradually varies resistance in circuit.

1,434,767. TELEGRAPH SYSTEM; J. H. Bell, South Orange, N. J. App. filed Dec. 4, 1918. Transmission of impulses in form of block signals for ocean cable.

1,434,773. TELEGRAPH; J. N. Correia, New York, N. Y. App. filed Oct. 23, 1918. System of cable telegraphy.

1,434,780. PORTABLE LAMP; W. D. Kahn, Cedarhurst, N. Y. App. filed Feb. 27, 1919. Battery flashlight.

1,434,790. TWO-WAY TRANSMISSION WITH REPEATERS; J. Mills, Wyoming, N. J. App. filed Sept. 6, 1919. For telephone lines.

1,434,795. SIGNALING DEVICE; H. W. Ryder, Cicero, Ill. App. filed Nov. 8, 1918. Combined with electric switch.

1,434,869. ELECTRIC REGULATOR; P. I. Wold and O. E. Buckley, East Orange, N. J. App. filed Aug. 21, 1918. Voltage regulator of thermionic type for generator.

1,434,884. TUBE-WELDING MACHINE; F. G. Gale, Waterville, Quebec, Canada. App. filed March 2, 1921. Machine for welding tubes which have been previously rolled into shape.

1,434,885. TUBE-WELDING MACHINE; F. G. Gale, Waterville, Quebec, Canada, and P. W. Shaw, Lynn, Mass. App. filed Aug. 20, 1921. Method of supporting and feeding tube.

1,434,894. HOLDER FOR DENTAL X-RAY FILMS; L. A. J. Hawkins, Jerome, Arizona. App. filed May 10, 1921.

1,434,918. TUBE-WELDING MACHINE; P. W. Shaw, Lynn, Mass., and F. G. Gale, Waterville, Quebec, Canada. App. filed May 5, 1922. Guiding means holds tube firmly in correct position.

1,434,925. TUBE-WELDING MACHINE; F. S. Stearns and C. W. Greene, Lynn, Mass. App. filed Jan. 24, 1917. Improved contact rolls.

1,434,968. CALL-DISTRIBUTING TELEPHONE SYSTEM; F. M. Slough, Forest Lawn, N. Y. App. filed July 1, 1913. Outlying lines automatically extended to operators' positions.

1,434,974. DYNAMO-ELECTRIC MACHINE; W. A. Turbayne, Niagara Falls, N. Y. App. filed March 31, 1916. Combined automobile starting motor and battery-charging generator.

1,434,975. TELEPHONY; H. S. Turner, Washington, D. C. App. filed Dec. 4, 1915. Relates to link connector circuits.

1,434,984. RADIO RECEIVING SYSTEM; H. H. Beverage, Riverhead, N. Y. App. filed May 3, 1921. Permits simultaneous reception of signals coming from more than one direction.

1,434,985. RADIO RECEIVING SYSTEM; H. H. Beverage, Riverhead, N. Y. App. filed May 3, 1921. Permits of the simultaneous reception of several signals.

1,434,986. RADIO RECEIVING SYSTEM; H. H. Beverage, Riverhead, N. Y. App. filed May 25, 1921. Enables very close tuning.

1,434,988. ELECTRIC GENERATING SYSTEM; C. P. Brockway, Toledo, Ohio. App. field April 8, 1919. Engine-driven storage-battery generator.

1,435,009. RADIO RECEIVING SYSTEM; E. W. Kellogg and C. W. Rice, Schenectady, N. Y. App. filed April 27, 1921. Permits the simultaneous reception of several signals.

1,435,050. BURGLAR LOCK FOR REVOLVING DOORS; D. H. Close, Keyport, N. J. App. filed Dec. 14, 1920. Electrically locked doors.

1,435,055. ELECTROTHERAPEUTIC APPARATUS; J. H. Eastman, Detroit, Mich. App. filed Dec. 8, 1921. Special arrangement of vibrator and adjusting screw on X-ray machine.

1,435,096. THERMOSTATICALLY CONTROLLED SADIRON; J. A. Amelianovich, Chicago, Ill. App. filed June 29, 1922. Thermostat placed at point of greatest heat.

1,435,116. AUTOMOBILE SIGNAL; H. Getcheli, Detroit, Mich. App. filed Feb. 15, 1921. Rear stop signal.

(Issued Nov. 14, 1922)

1,435,195. REGULATING TRANSFORMER; A. L. Atherton, Pittsburgh, Pa. App. filed June 18, 1919. Constant-current transformers.

1,435,203. REGULATOR SYSTEM AND APPARATUS; C. A. Boddie, Pittsburgh, Pa. App. filed Aug. 10, 1918. Maintains constant voltage on lines.

1,435,206. IMPULSE-CORRECTING REPEATER; H. B. Brown, Chicago, Ill. App. filed Dec. 13, 1917. For automatic telephone lines.

1,435,207. SYSTEM OF CONTROL; A. H. Candee, Pittsburgh, Pa. App. filed Dec. 22, 1919. Multiple-unit control of electric vehicles or trains.

1,435,209. BRUSH HOLDER; J. L. Chantemerle, Turtle Creek, Pa. App. filed March 14, 1918.

1,435,210. HIGH-VOLTAGE-PRODUCING MEANS; L. W. Chubb, Edgewood Park, Pa. App. filed Jan. 25, 1919. Electrostatic machine placed in evacuated chamber.

1,435,211. ELECTRIC FURNACE; O. A. Colby, Irwin, Pa. App. filed May 4, 1920. Melting furnace of electric-resistance type.

1,435,213. PROTECTOR; W. I. Cook. App. filed May 8, 1919. Lightning arrester for communication lines.

1,435,215. ELECTRIC REGULATION; J. L. Creveling, Tucson, Ariz. App. filed Sept. 27, 1920. Voltage regulator for generator.

1,435,225. INSULATOR; G. I. Gilchrest, Wilkinsburg, Pa. App. filed Oct. 8, 1918. Pin protected from damage due to corona or flashover.

1,435,229. ELECTRICAL SYSTEM; F. C. Hanker, Wilkinsburg, Pa. App. filed Sept. 27, 1918. Automatic rotary-converter apparatus.

1,435,230. CONTROL SYSTEM; A. L. Harvey, Wilkinsburg, Pa. App. filed Jan. 25, 1919. Automatic restart for isolated motors.

1,435,238. SYSTEM OF MOTOR CONTROL; H. D. James, Wilkinsburg, Pa. App. filed April 4, 1916. Apparatus for automatically charging blast furnaces.

1,435,240. SIGNALING SYSTEM; K. S. Johnson, Jersey City, N. J. App. filed Dec. 29, 1916. Means for establishing communication between anchored balloon and ground.

1,435,241. SYSTEM OF CONTROL; H. H. Johnson, Edgewood Park, Pa. App. filed Jan. 14, 1921. Emergency means for interrupting circuit and actuating air brakes.

1,435,243. AUTOMATIC HAND TELEPHONE; Le R. W. Kelsay, New York, N. Y. App. filed Sept. 24, 1920. Hand telephones provided with impulse transmitters.

1,435,249. AUTOMATIC TELEPHONE SYSTEM; T. G. Martin, Chicago, Ill. App. filed Feb. 4, 1918. Method of extending connections from one exchange to another.

1,435,253. CALLING DEVICE FOR AN AUTOMATIC TELEPHONE SYSTEM; W. W. Owen, Oak Park, Ill. App. filed May 26, 1919.